INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

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DETROIT

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- **The Quartermaster Department Trains Its Instructors**—*Gwynn*
- **More About Vocational Guidance**—*Twogood*
- **What Shall We Teach When the War is Over?**—*Wells*

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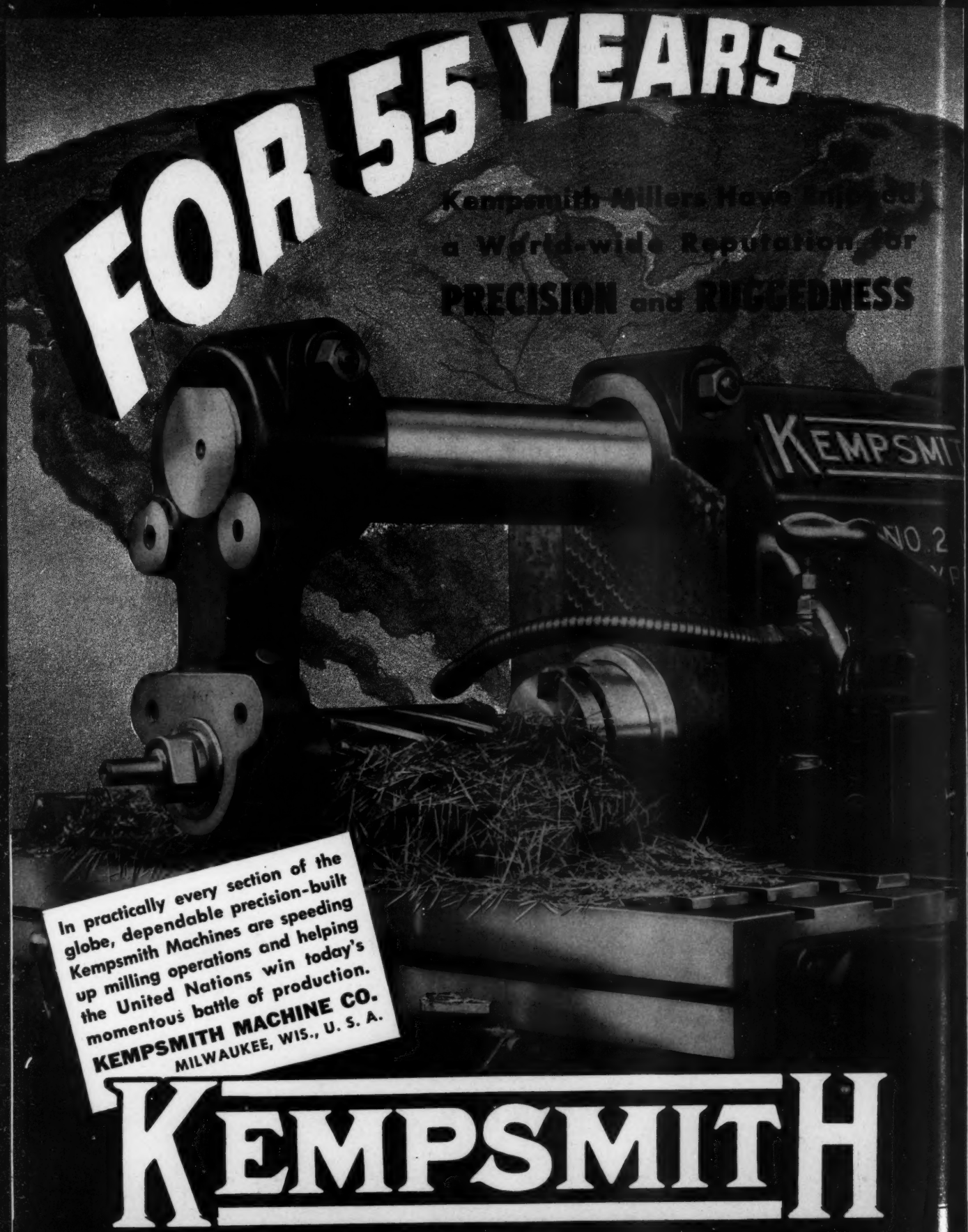
FOR 55 YEARS
Kempsmith Millers Have Enjoyed a World-wide Reputation for
PRECISION and RUGGEDNESS
KEMPSMI
NO. 2
In practically every section of the globe, dependable precision-built Kempsmith Machines are speeding up milling operations and helping the United Nations win today's momentous battle of production.
KEMPSMITH MACHINE CO.
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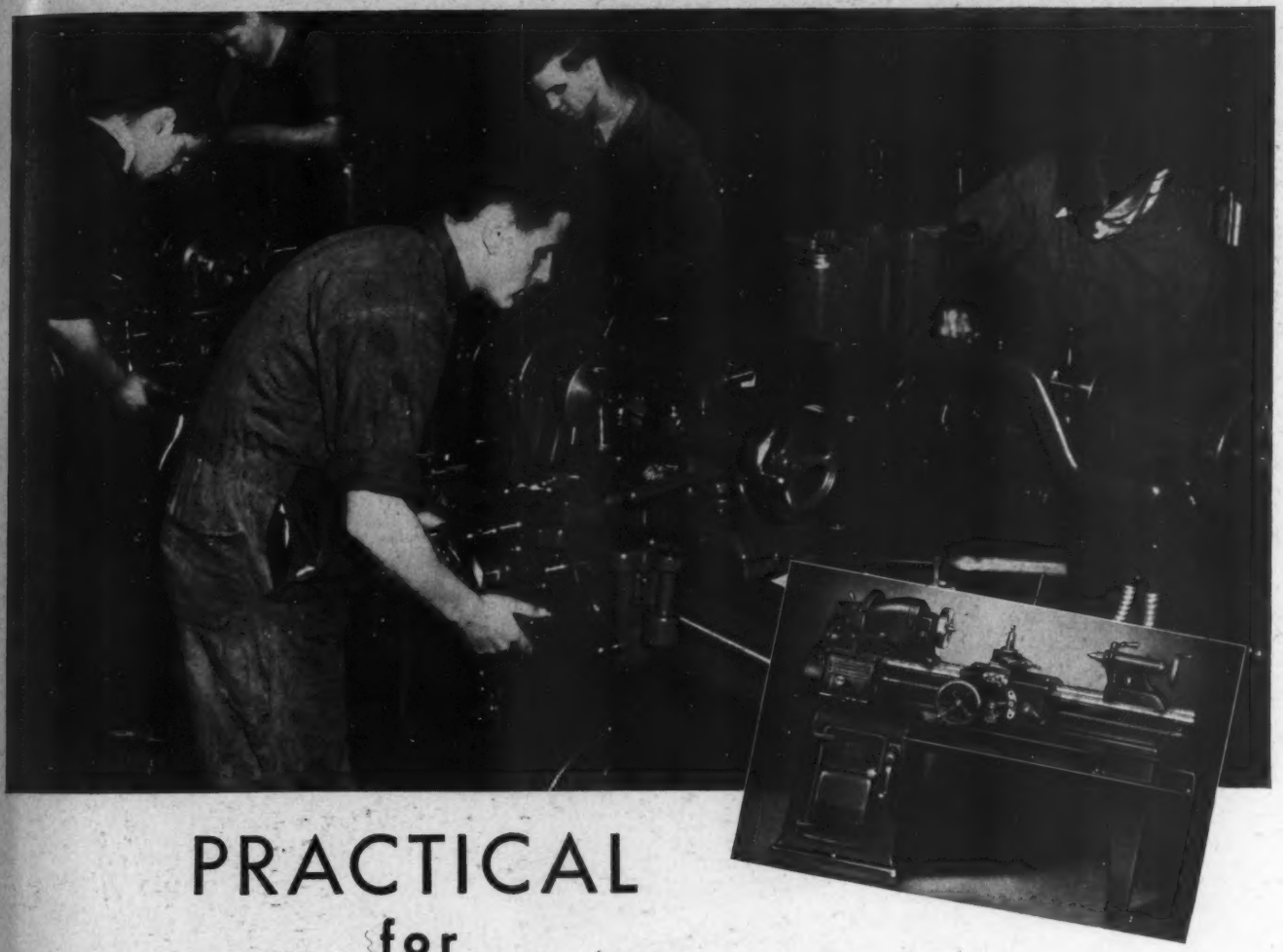
KEMPSMITH

SOUTH BEND LATHES



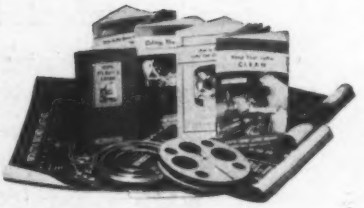
PRACTICAL for War Production Training

SOUTH BEND
13" ENGINE LATHE

Pre-employment training for war production workers must be thorough and practical. To give the trainee an "idea" of the type of work for which he is being prepared is not enough. He must have actual experience in operating full sized war plant machinery if he is to take his place on the production line with a minimum loss of time, effort, and material.

The wide use of South Bend Lathes in war industries makes them especially practical for war production training. Their ease of operation, accuracy, and modern design which have made them popular in industrial shops are the same features that make them the choice of both shop instructors and trainees.

The variety of sizes and models in which South Bend Lathes are manufactured offers a wide choice for practical training purposes. Write for a copy of Catalog 100-C in which they are all described and illustrated.



TEACHING HELPS
for Shop Classes

South Bend teaching helps—books, sound films, wall charts, and bulletins on the care and operation of a lathe—are available for school shop instruction. Write for Bulletin 21-C.

★ BUY WAR BONDS ★

SOUTH BEND LATHE WORKS
SOUTH BEND, INDIANA • LATHE BUILDERS FOR 36 YEARS

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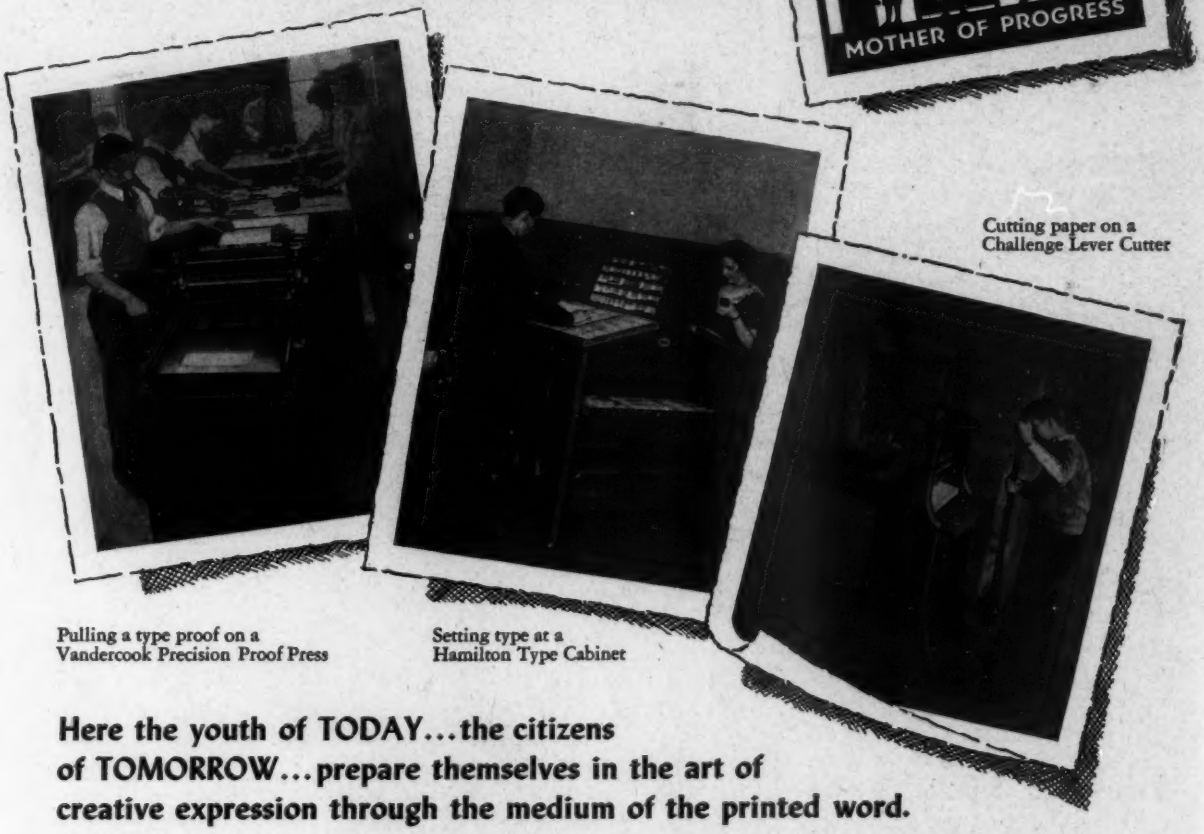
Freedom of the Press and Free Public Schools are the Cornerstones in the Foundation of American Democracy... Printing and Education are most vital factors in our Industrial Civilization.



Pulling a type proof on a Vandercook Precision Proof Press

Setting type at a Hamilton Type Cabinet

Cutting paper on a Challenge Lever Cutter

Here the youth of TODAY... the citizens of TOMORROW... prepare themselves in the art of creative expression through the medium of the printed word.

A well organized printing department in your school will give life and vitality to your entire school program. Printing is America's most important major industry because it is *basic to all industries!*

ATF Department of Education has assisted 3,000 schools in the organization of their Graphic Arts programs. Let us assist you to prepare *your* postwar plans, whether they be in the Graphic Arts or the Vocational Education field. This service is *without charge or obligation.* Write for details and literature.

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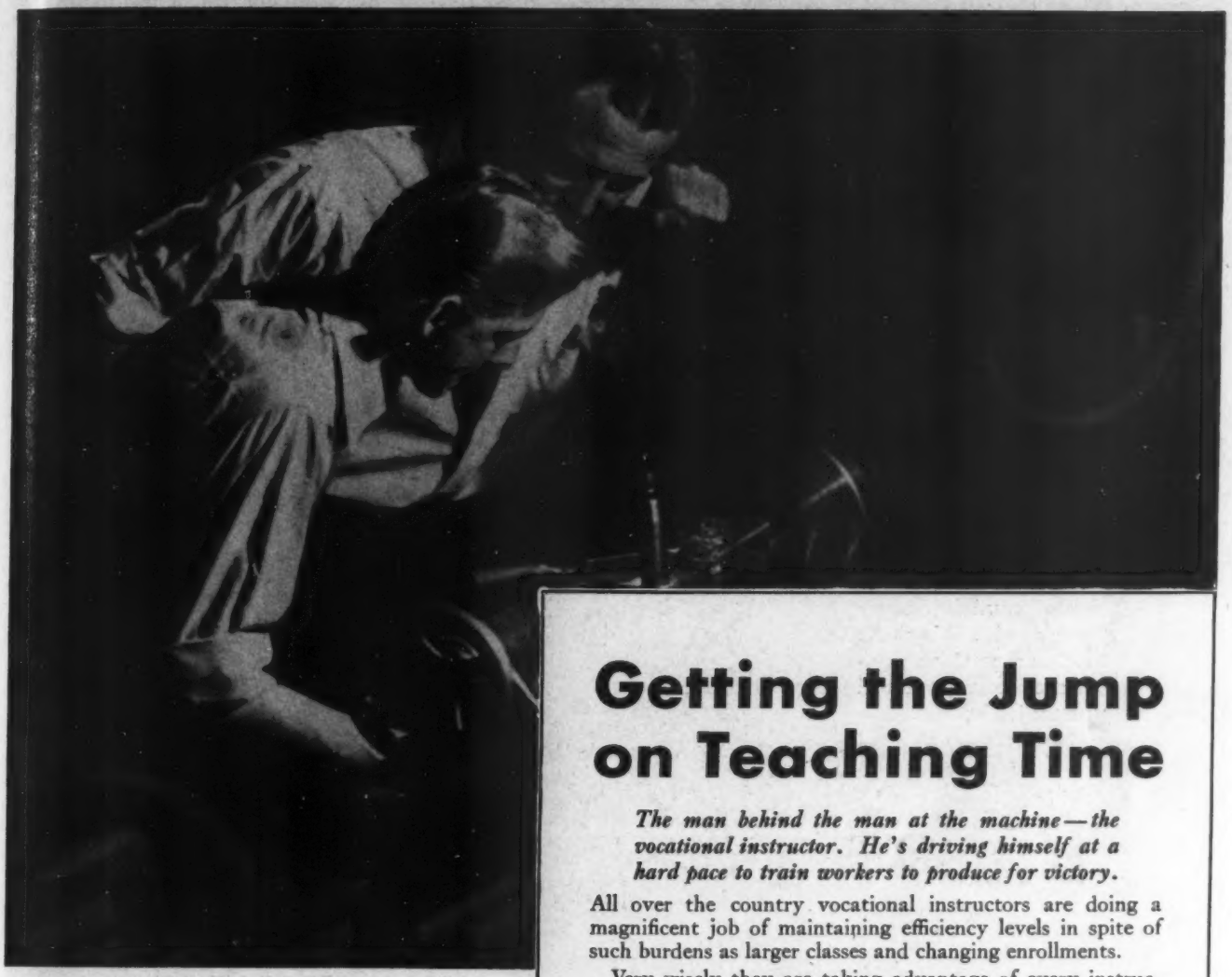


Getting the Jump on Teaching Time

The man behind the man at the machine—the vocational instructor. He's driving himself at a hard pace to train workers to produce for victory.

All over the country vocational instructors are doing a magnificent job of maintaining efficiency levels in spite of such burdens as larger classes and changing enrollments.

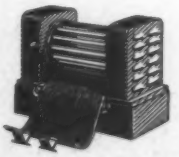
Very wisely they are taking advantage of every instructional aid and teaching device to make each classroom minute count most. For example, they have found that materials produced on the Mimeograph duplicator are an invaluable aid in relieving classroom routine and keeping instruction individualized.

Lesson sheets, training bulletins, course outlines, specialized material to fit the needs of local industry—all these vital requirements and many more can be produced easily and quickly on the Mimeograph duplicator.

These are good days to make sure your Mimeograph equipment is doing all it can to help your school work for victory. Call the Mimeograph distributor in your community for assistance, or write direct to A. B. Dick Company, Chicago.

The Mimeograph Photochemical Printer

Obtainable without a preference rating



Give every pupil his own copy of project drawings and other essential visual materials. The Mimeograph photochemical printer provides a new method of making duplicate copies of ink tracings, in quantity, at very low cost. Write A. B. Dick Company, Chicago, for details.

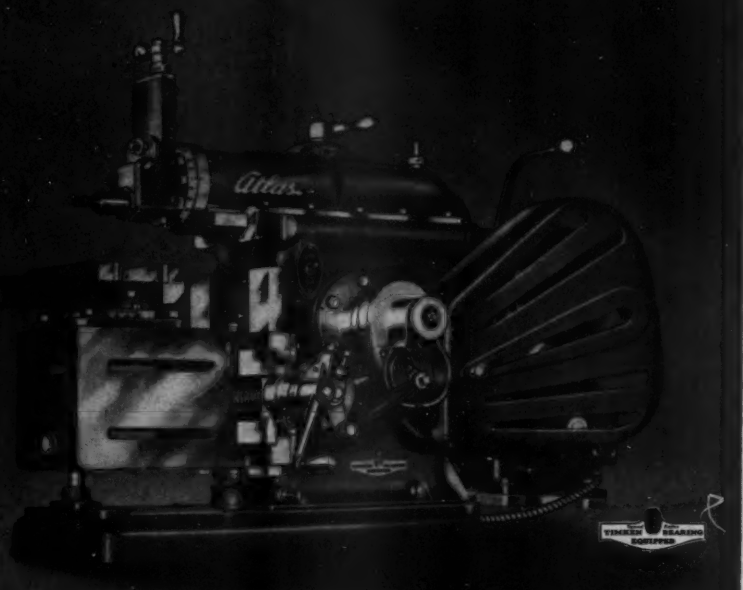
Mimeograph duplicator

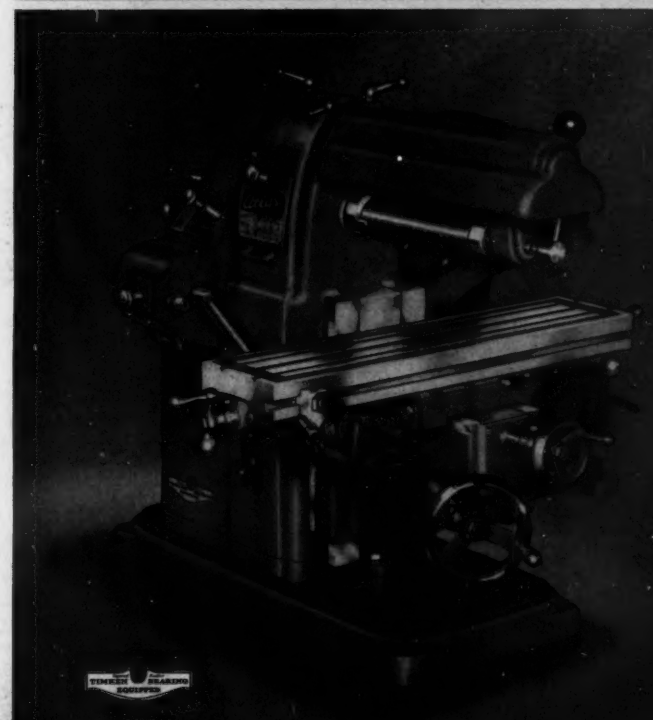
MIMEOGRAPH is the trade-mark of A. B. Dick Company, Chicago, registered in the U. S. Patent Office.

Atlas TOOLS TO SPEED WAR PRODUCTION TRAINING

SHAPERS

Atlas 7-inch Shapers handle important small-parts jobs in war plants throughout the country. Incorporating all the precision and power of larger, more expensive machines, they perform all shaping operations within a 7" stroke. Have 4 speeds and 5 automatic cross feeds. Atlas Shapers quickly give trainees the feel and precision experience necessary to actual on-the-job success.





MILLING MACHINES

These compact, powerful precision bench milling machines give students training in every milling operation, at low cost. Handle the full range of milling, from slabbing and facing cuts to end milling, keyway cutting, finishing and layout work. Precision ground table 4½" x 18". For speedier orientation, train your students on an Atlas — the same miller they'll find in hundreds of production plants.

Complete specifications and job applications for Atlas Shapers, Milling Machines, 10" Lathes, and Drill Presses will be sent promptly on request.

ATLAS PRESS CO.
1071 N. PITCHER ST.
KALAMAZOO • MICHIGAN

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They LEARN with Them

Student from Iowa Aircraft School drilling simulated airplane part with Black & Decker ¼" Drill. All students (enrollment several hundred) get the "feel" of B & D Tools here.

Vibro-Centric Valve Seat Grinder being used by student who is learning aircraft valve reconditioning. When he "graduates" to war industry, he'll be using B & D Tools there, too.

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Black & Decker Drills, first choice in America's leading war plants, are used on scores of assembly, drilling and boring operations throughout industry.

Setting Screws for boat construction. A Black & Decker "graduate" finds the same B & D Tools he learned with are the stand-bys in this boat yard.

VOCATIONAL schools and shops that standardize on Black & Decker drills and tappers, screw drivers and nut runners, sanders and grinders, saws and shears, know that the student who learns with B & D Tools has a greater chance of earning with these same tools later. That's because there are more Black & Decker Electric Tools used in war industry today than any other kind . . . you'll find them in over 50% of America's war plants.

Train the rookies of America's production army the *right* way. Let students get the "feel" of these husky, precision-powered tools from the very start of their careers. If you need help in selecting tools for your training program, or would like a demonstration, phone your nearby Black & Decker Distributor today. He'll be glad to work with you. Or write for catalogs and FREE instructive handbooks to: The Black & Decker Mfg. Co., 780 Penna. Ave., Towson, Md.

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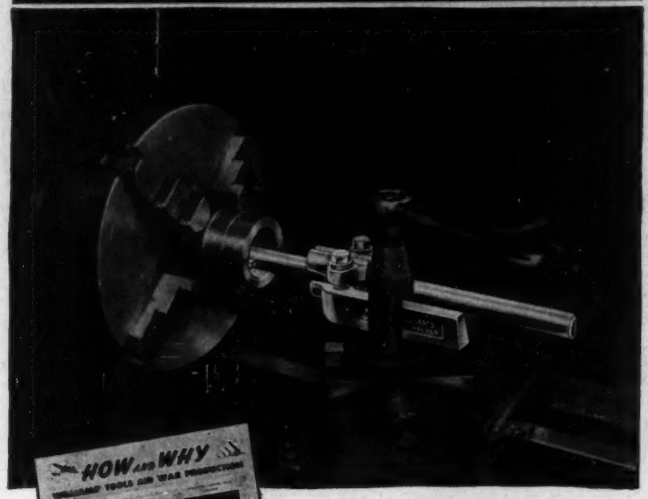
PORTABLE ELECTRIC **TOOLS**

HOW TO USE WILLIAMS' LATHE TOOLS FOR INTERNAL THREADING



FREE!
WILLIAMS' TOOL DATA SHEETS

Once explained, internal threading with Williams' Tools is simple. Data Sheet No. 15 tells how. Other Data Sheets in the series are listed below. Circle the numbers of those desired on coupon and mail today. They're punched for 3-ring binder.

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BASIC RADIO PRINCIPLES

Fills the urgent wartime need for a text on radio written from the *vocational* point of view. Gives the student basic radio fundamentals, ability to identify materials used in radio and their symbols, ability to interpret diagrams, and an understanding of the principles involved in the operation of radio equipment. Treatment is simple, with the omission of mathematics, formulas, physics, and difficult graphs. Textbook edition, $2.25.

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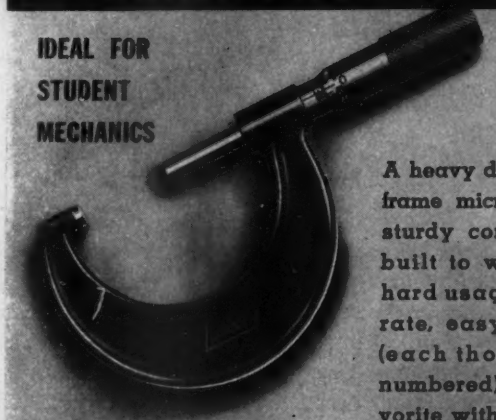


A heavy duty ribbed frame micrometer of sturdy construction built to withstand hard usage. Accurate, easy to read (each thousandth numbered). The favorite with industry and schools alike. Write for catalog.

"TEACH GOOD WORKMANSHIP WITH GOOD TOOLS"

LUFKIN
SAGINAW, MICHIGAN · NEW YORK CITY

Four are FILING—The Fifth is FIGHTING

CAN a file ease the manpower shortage? Yes. By doing more work—and doing it better. With a Delta file, four strokes do the work of five.

Army men found a new rifle that would shoot more bullets in the same time it took the other makes. They were quick to tell the recruits about it—to show them how it worked, to urge its use.

Vocational instructors, training the production soldiers of the future, must know this: Delta Files will do on the average 25% more work, in the same amount of time, with the same effort—*proved by actual scientific tests.*

A Delta file digs deep. Cuts away the metal fast, Clean. Levels without scratching or sliding. It was made to do the job better.

A worker's time is precious. He can only go as fast as his tool will permit. See that the man in training gets *full capacity* out of his file. For, with four workers using Delta files, the fifth is free to fight.

DELTA FILES

DELTA

DELTA FILE WORKS, Inc.
Philadelphia 37, Pa.

MAKE THIS TEST

Clamp a bar (say 1 inch square), upright in a vise. Cut a hole in a sheet of paper to fit over the bar. Take 50 or 100 strokes with a Delta, each side, and collect the filings. Do the same with your present file. Now, weigh the filings. The difference is likely to surprise you.

WEIDENHOFF

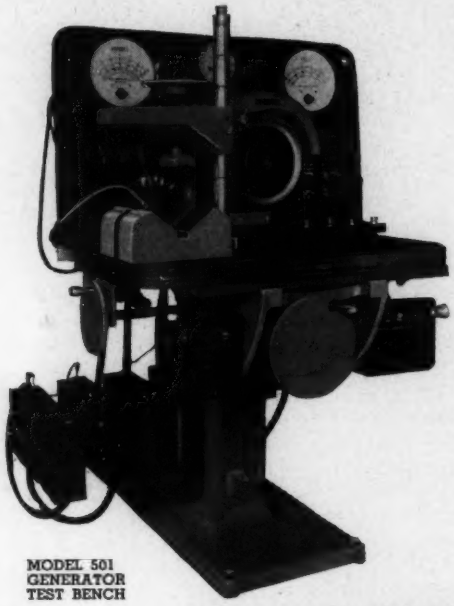
Automotive - Aviation

SERVICE EQUIPMENT

TAKE CARE OF YOUR EQUIPMENT

The greatest good is obtained from automotive electrical testing equipment if a little time is taken to keep it in good operating condition. Equipment of this kind incorporates many precision built units which should be carefully protected to insure accurate results over long periods of use. School instructors are urged to check up on the condition of their Weidenhoff equipment particularly now when school activities are getting under way.

Below are given a few timely suggestions that will help to attain the results desired. These precautions will help to keep test equipment at peak efficiency and reduce the need for maintenance.



MODEL 501 GENERATOR TEST BENCH

HANDBOOK OF ENGINE MAINTENANCE — A practical treatise dealing with the fundamentals of automotive electricity and allied units. Subjects covered include automotive electric systems, magnetism and electricity, the ignition system and high-tension magneto. Price $1.50. Sent free for limited time to instructors requesting it on their letterhead.

SOME TIMELY TIPS

All switches of a test bench or other apparatus should be in the OFF position when the equipment is not in use. It provides protection to the meters.

Be exceedingly careful of voltmeters, ammeters, etc. They may be damaged and replacement may be impossible.

Take exceptionally good care of all test leads. Keep them free from oil and grease.

If amperage or voltage is to be checked be sure to select a scale high enough so the meter will not be damaged.

At regular intervals wipe off any trace of moisture and keep the equipment in a dry place.

Your testing equipment will have to do for the duration. Conserve it in every way possible.

KEEP BUYING WAR BONDS AND STAMPS

JOSEPH WEIDENHOFF, INC., CHICAGO 24, ILL, U. S. A.

TEST BENCHES ENGINE ANALYZERS BATTERY CHARGERS MAGNETO TESTERS ELECTRICAL TESTING & SERVICE EQUIPMENT

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No. 130 Hi-Speed Steel Heat - Treating Furnace

A furnace which can teach your students how to heat-treat properly. Reaches 2300° F. in just 22 minutes. Lined with hi-temperature insulating refractory. Equipped with 4 burners and large Johnson blower. Firebox, 13"x13½"x 5½". $248.00 F.O.B. Factory.

Order yours today, and get 2 weeks' delivery.

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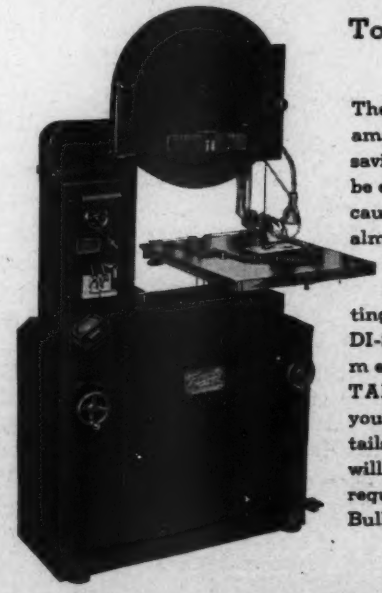
Tannewitz DI-SAWS

are ESSENTIAL to Teaching MODERN Tool & Die Making



The innumerable and truly amazing time and money-saving shortcuts which may be effected by DI-SAWING is causing this equipment to be almost universally adopted by the leading shops. For inside and outside cutting, filing and polishing the DI-SAW is obsoleting other methods. Put the TANNEWITZ DI-SAW on your MUST list. Complete details of this exellent machine will be sent you promptly on request. Just ask for DI-SAW Bulletin.

THE TANNEWITZ WORKS, GRAND RAPIDS, MICH.

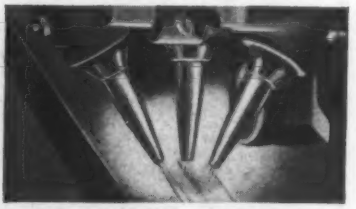
Christened . . . with FLAME!

FLAME . . . as well as champagne christens ships. The last act that frees a ship from the ways is the cutting of steel bonds by oxy-acetylene flame. This swift cutting of steel typifies the way the oxy-acetylene flame is speeding the fabrication of ships, aircraft, locomotives, guns, shells, tanks, and hundreds of other vital articles made of metal.

All over America, this flame cuts time and gives to mass-production industries a means of manufacturing faster, better, and at lower cost. Since the white-hot oxy-acetylene flame cuts through metal as easily as a saw through wood, it makes steelworking as simple as carpentry! From the time steel is made . . . until it is finally cut up for scrap and sent back to the steel mills for a new lease on life . . . oxy-acetylene flames expedite its treating, cutting, and fabricating.

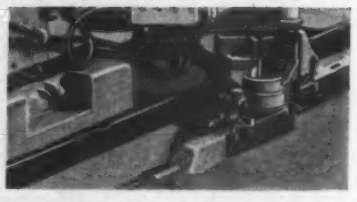
The oxy-acetylene flame is not new. Oxygen, acetylene, and many machines and techniques for treating, cutting, and fabricating metals have been made available to industry for years by THE LINDE AIR PRODUCTS COMPANY, a Unit of UCC. The present wide application of Linde's peacetime research and development . . . coupled with the great expansion of Linde's oxygen-producing and engineering facilities *before* the emergency arose . . . are contributing vitally to this country's mass output of the things it needs. These products and processes—plus new ones that are stemming from today's continuing research — are important among the mass-production tools that can be used in the future to bring you better cars, trucks, tractors, washing machines, refrigerators, and many other things for better living at lower cost.

LIQUID OXYGEN! The demand for oxygen today is great. Driox liquid oxygen has made it possible for mass-production industries to be supplied in bulk. Liquid oxygen—occupying only 1/862 of the volume of gaseous oxygen—is shipped in tank cars and tank trucks and converted to gaseous oxygen as needed.



KNIVES THAT NEVER DULL! Oxy-acetylene flames held in mechanical arms trim and bevel steel plates for welding in a fraction of the time required by methods formerly used . . . cut in straight lines, circles, or in irregular patterns. The flames are also used to harden and soften metals and to prime them for painting.

SPEEDING QUALITY STEELS! Production line efficiency in removing surface blemishes from new steel became possible with the Lin-de-Surfacer scarfing machine. Huge mechanized batteries of oxy-acetylene flames "skin" hot steel . . . quickly and economically . . . resulting in higher yields of quality steel.



MECHANIZED WELDING! "Unionmelt" electric welding automatically joins steel plates as much as 20 times faster than any similarly applicable method . . . and does it without noise, fuss, or sparks. This process complements the hand and mechanized methods of welding with the oxy-acetylene flame.

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THIS IS A METAL AGE. In spite of new materials—plastics and plywood—crowding into the production picture, the war has intensified the problems of metal fabricating and finishing.

Only actual experience in the use of *industrial* abrasives can give your students the training they need to fit them for places in industry.

Give them Behr-Manning

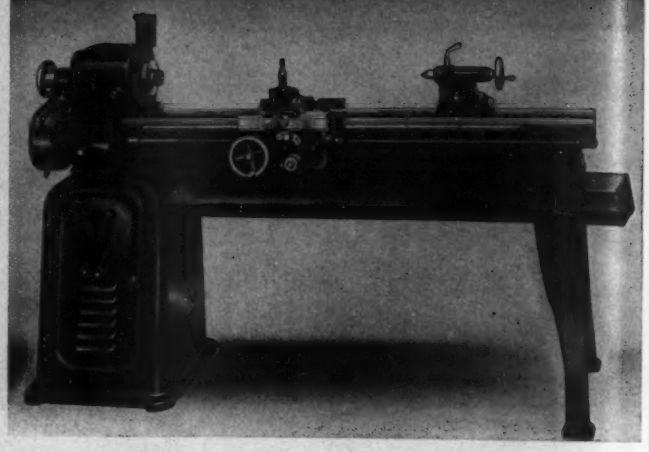
"METALITE"

to work with—a technically-made abrasive line that will give them an appreciation of modern metal production methods.

(And if you need concise, up-to-date information about those methods, we shall be only too glad to supply it.)

BEHR-MANNING
(Division of Norton Company)
TROY, N. Y.
Quality Coated Abrasives Since 1872

SHELDON

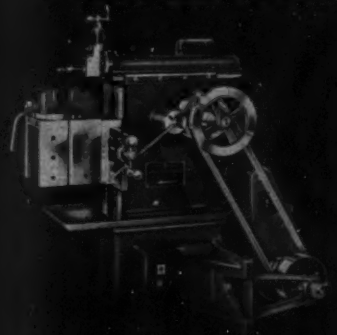


SHELDON BBU-1240 WQ PRECISION LATHE

This quality 12 in. ball bearing tool room lathe is built for precision work and will retain its accuracy under long and hard usage. It has extra collet capacity (to 1" round), the finest precision ball or roller bearings obtainable, an improved heavy-duty, double wall apron with power cross feed; full quick change gears and full bowl headstock. Its improved Sheldon 4-speed, V-belt, lever-clutch operated, underneath motor drive is entirely enclosed in the pedestal leg and has anti-friction bearings. It is so designed that spindle belts operate thru a *standard* 1-piece bed. This bed is bridge-braced with heavy cross girts and has hand scraped ways—2 V-ways and 2 flat ways.
If interested in 10", 11" and 12" quality lathes be sure to see the SHELDON.

SHELDON MACHINE COMPANY, INC.
4244 N. Knox Avenue CHICAGO, U. S. A.

RHODES
7" HORIZONTAL SHAPER
3½" VERTICAL SLOTTER

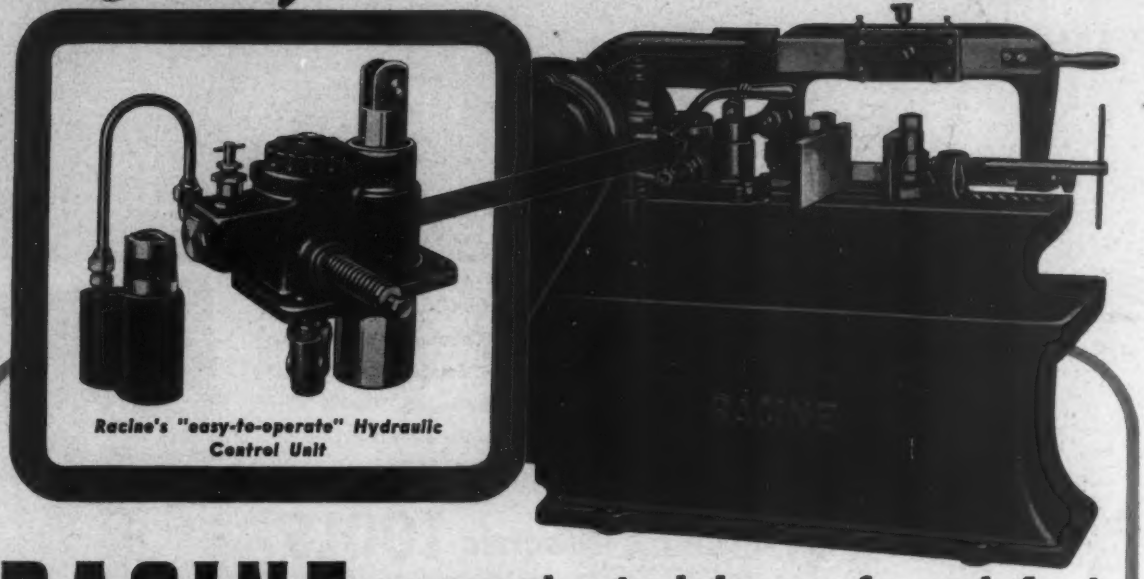


Convertible
TO A SHAPER OR SLOTTER
IN 15 MINUTES!

RHODES MFG. CO., Waltham, Mass.

Easy to operate!

"Utility" Wet Cut Saw Model
Capacity 6" x 6"



Racine's "easy-to-operate" Hydraulic Control Unit

RACINE saws make training safe and fast

The Modern Saws for Modern Training

The Racine Hydraulic Feed Controls on this general purpose Metal Cutting Saw are identical to those found on Racine's High Speed Production Machines operating in the most modern war production plants today.

Safer and faster training with Racine Saws is possible because of complete safeguards and simplicity of controls and operation. Likewise, blade life is longer and only a minimum amount of servicing is required.

"Utility" Dry Cut Model

This "Dry Cut" Saw, without the coolant equipment, cuts at slightly lower speeds. Other features and capacities identical.

Other Racine Saw Models

Racine makes a complete line of metal cutting machines for general purpose and high speed cutting work. Capacities from 6" x 6" to 20" x 20". Complete data and prices furnished on request. Address Dept. SE-S.

Investigate Racine Oil Hydraulic Pumps and Valves

Racine "Variable Volume" Pumps—a modern source of hydraulic force for bending, feeding, forming, moulding and clamping operations. Capacities — 0 to 30 G.P.M. at 50 to 1000 lbs. pressure per sq. inch.

Four - Way Hydraulic Valves in sizes 3/8" to 1 1/2" for the control of hydraulic circuits.

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Standard for Quality and Precision
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Make "FANCY" Finish a part of Every Project

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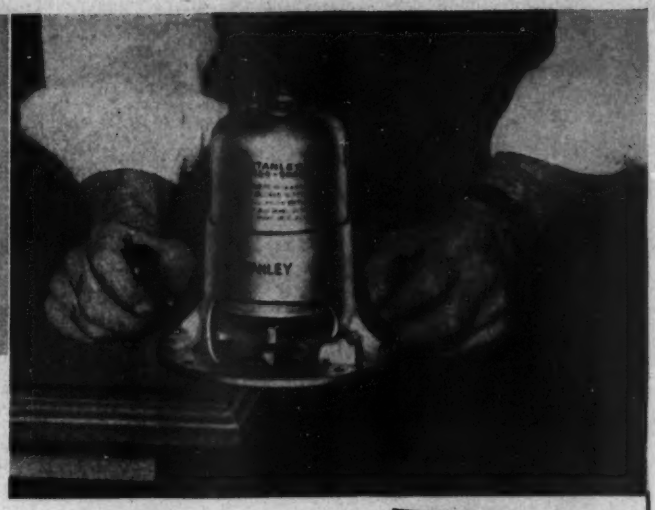
STANLEY No. 10 ROUTER-SHAPER

3/8 H.P. 18,000 R.P.M.



Let your boys put a professional finish on their work with a Stanley No. 10 Router-Shaper and you'll see a 100% response in added interest. Plenty of variety . . . use it for inlaying, veining, carving, dovetailing, rabbetting, and many shaping cuts. Its high speed motor, 18,000 R.P.M., permits smooth, clean cutting, both with and against the grain.

Catalog No. 606 gives the complete story. Be sure to have a copy for reference. Stanley Electric Tool Division, The Stanley Works, 112 Elm St., New Britain, Conn.

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Teach with the tools actually used in industry.

With ARMSTRONG TOOL HOLDERS—used in over 96% of the Machine Shops and Tool Rooms. Develop "tool sense" and a love for fine tools with ARMSTRONG Drop Forged WRENCHES—Carbon and Chrome-Vanadium Steel Open End Wrenches; Box Socket and Detachable Socket Wrenches with improved designs, better balance, finer machining and finish. Set up jobs with modern, safe ARMSTRONG Drop Forged Setting-Up Tools. Use ARMSTRONG Drop Forged Clamps that never slip, spring or spread, and ARMSTRONG Drop Forged Lathe Dogs that are standard everywhere.

Write for Cutter Grinding Charts and new C-39 Catalog. Sent to Instructors upon request

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"The Tool Holder People"

322 N. Francisco Ave., Chicago, U. S. A.

Eastern Warehouse & Sales Office: 199 Lafayette St., N. Y.

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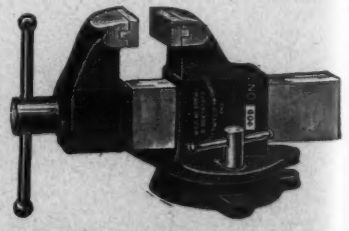
TRAIN THEM WITH WHAT THEY WILL USE

★ It's no secret that Columbian Vises are industry's first choice. For over thirty years they have been made to the same high standard of engineering and workmanship. That's why Columbian is the world's largest producer of vises. Remember the vise is the most important tool on the bench. Be sure it's a COLUMBIAN. Vises for every need and purpose.

Columbian Continuous screw Woodworker's vises are furnished with hard wood handles—or may be equipped with ADJUSTABLE STEEL HANDLES, as above, to eliminate handle breakage, speed operation and provide extra leverage.



Columbian Machinist's Vises are made of malleable iron castings, guaranteed unbreakable, and designed to provide accurate, dependable equipment for school and industrial shops. All standard types.

THE COLUMBIAN VISE & MFG. CO.

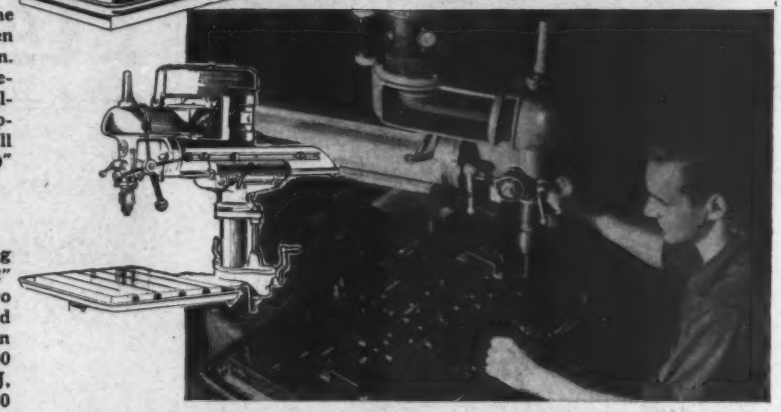
9022 BESSEMER AVENUE CLEVELAND 4, OHIO

THE WORLD'S LARGEST MAKERS OF VISES

TODAY, VOCATIONAL SCHOOLS ARE TRAINING "Career Men"

The importance of the work of the skilled mechanic is fully appreciated today. In the post-war economy, too, he will have rare opportunity. This realization has led many young men to choose technical training, who might otherwise have sought a "white collar" job. They want practical, thorough and speedy training — for a war plant job today and a stake in the tremendous industrial rehabilitation that must follow this war.

Hundreds of leading vocational schools use Walker-Turner Machine Tools for this important educational job. They like their simple, modern design and rugged construction that enables them to endure 24-hour training schedules with inexperienced operators. Priced within easy reach of school budgets, Walker-Turner Machine Tools are available promptly for war production training.



WALKER-TURNER 15" DRILL PRESS

Made in bench and floor models. Six-spline spindle. Pulley straddle mounted between bearings, eliminates whip due to belt strain. Drills to center of 15" circle. One-piece close-grained gray iron head closely fitted to column. Jacobs 0-½" key chuck regular equipment. Run-out accuracy well within all industrial standards. Also available in 20" models, with or without power feed.

WALKER-TURNER RADIAL DRILL

Handles light drilling, tapping and routing operations effectively. Drills to center of 62" circle. Maximum distance nose of chuck to table, 13½". Spindle traverse, 3¾". Head tilts to 45° in either direction. Available in two models, RD1170, 4 speeds, 600 to 5,000 R.P.M., with 1740 R.P.M. motor; RD1175-J, 16 speeds, 160 to 8200 R.P.M., with 1740 R.P.M. motor.

WALKER-TURNER BAND SAW

14 in. and 16 in. models. Back gearing and cone pulleys provide speed range from 61 to 5300 s.f.m. for cutting practically any material from steel to wood. Tables are heavily ribbed and carefully machined, tilt to 45° and have mitre gauge grooves. Blade tensioning devices have spring cushions to absorb shocks. Guard construction assures complete protection to operator.

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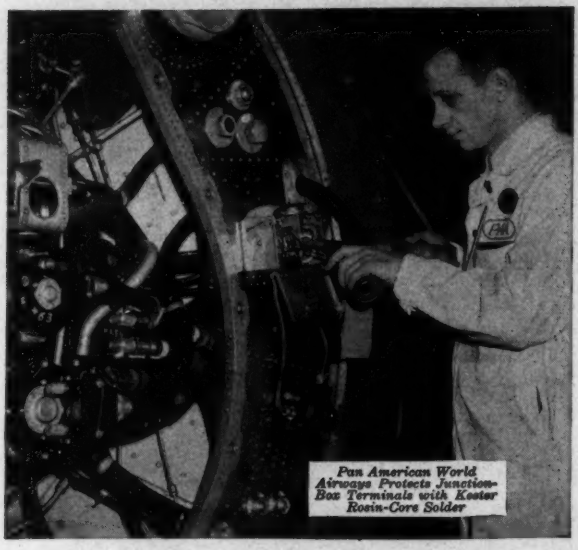
WITH ALL THE WORLD ON WINGS...



Pan American World Airways Protects Junction-Box Terminals with Kester Rosin-Core Solder

Your Boys Need to Know KESTER SOLDER

- The basic knowledge of Kester Flux-Filled Solder and how to use it, gained in your classes today, will be invaluable to your students in the air-world of tomorrow!
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- That means when you teach soldering with Kester, you're giving your classes *practical* instruction. They're learning the right way—using the technique and material of industry itself.
- Students like to work with Kester Flux-Filled Solders. They learn more easily, get better results. Flux and alloy are applied together in one simple operation. No separate flux to spatter the benches and floors of your school-room.
- Boys and girls alike will thank you—they'll reflect credit on you, their instructor—for teaching them KESTER soldering.

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Built to stand the hard, everyday grind of production work, Hargrave Tools have been accepted for more than 64 years as leaders in their field. Over this lengthy period, many improvements have been worked out with the aid of skilled mechanics from some of the nation's largest plants—resulting in tools of the finest workmanship, durability and efficiency.

Write for Catalog showing our complete line of Clamps, Chisels, Punches, Bench Anvils, Saw Vises and other tools for the SCHOOL SHOP.

SEE YOUR SUPPLY HOUSE or write Dept. VO for information

The CINCINNATI TOOL Co.
Est. 1879 CINCINNATI 12, OHIO

To help save strategic materials

TEACH YOUR STUDENTS TO USE THE RIGHT WHEEL FOR THE JOB!

BOTH steel and abrasives are among the important "Weapons for Production". Aside from their extensive use in war production, one of the reasons why these materials are on the strategic list is that inexperienced workers do not know how to get the most out of their tools and grinding wheels. Use this chart to teach your students how to choose the right wheel for the job. Thus you will save these materials in your instruction work. And when the student goes out into industry he will continue to use them wisely.

GENERAL PURPOSE GRINDING

GRADING RECOMMENDATION FOR SCHOOL SHOPS

ALOXITE BRAND ALUMINUM OXIDE VITRIFIED WHEELS

WHEEL DIAMETER	ROUGHING	SEMI-FINISHING	FINISHING
4", 5", 6"	40-J-30	60-J-30	100-J-30
7"	40-J-30	60-J-30	80-J-30
8"	36-J-30	60-J-30	80-J-30
8"	30-I-30	40-J-30	60-J-30
10"	24-H-30	40-J-30	60-J-30
12"	24-H-60	40-J-30	60-J-30

CLIP THIS CHART AND FILE IT FOR FUTURE REFERENCE

Every hour this war is shortened will save $12,000,000. The lives it will save are priceless. Let's get it over with—quickly!

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THE CARBORUNDUM COMPANY • NIAGARA FALLS, N. Y.

REG. U. S. PAT. OFF.

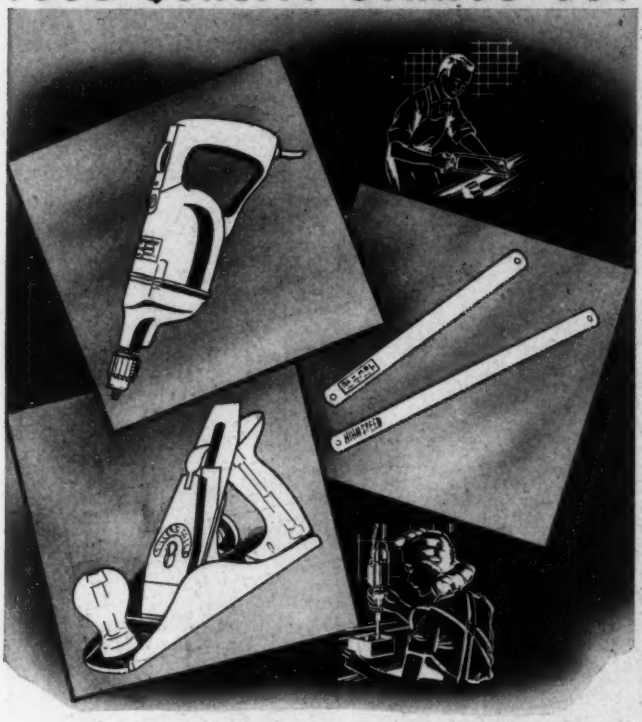
MANUFACTURERS OF GRINDING WHEELS, COATED ABRASIVES, SUPER REFRACTORIES, HEATING ELEMENTS

Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh, Cincinnati, Grand Rapids

(Carborundum is a registered trade-mark of and indicates manufacture by The Carborundum Company)

When the School Shop goes on Shifts...

TOOL QUALITY STANDS OUT



As you train more and more youngsters and former clerical and office workers in the crafts of production, real *quality* in your training tools stands out. As your shop goes on shifts, and crowds a year of training into short weeks, your Millers Falls tools *prove* themselves a worthwhile investment. For the *more nearly* school conditions approach those of the plants and factories where most Millers Falls tools are used, the *more evident* become the benefits that good design, good materials, and good production craftsmanship put into Millers Falls equipment.

GET DETAILS. You'll find the easy-handling, trouble-free service of Millers Falls tools worth investigating. Catalog, sent free on request, shows the Millers Falls hand tools, portable electric tools, hack saw blades, and precision tools in the current line.

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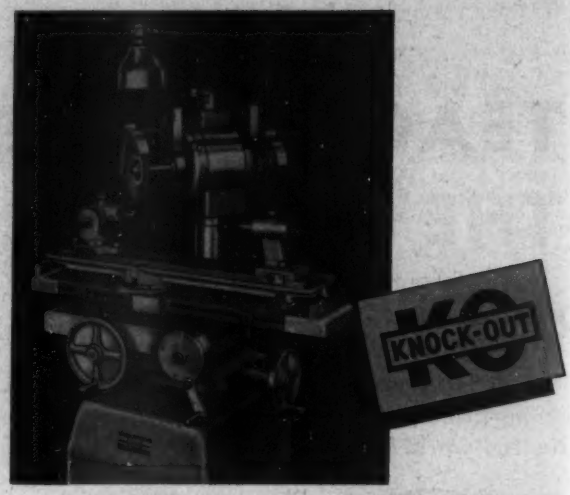
SINCE 1868

MILLERS FALLS COMPANY GREENFIELD, MASS.



The New K-O UNIVERSAL TOOL GRINDER

... now coming off the assembly line. Maintenance or production with speed, accuracy, and dependability at minimum capital outlay.

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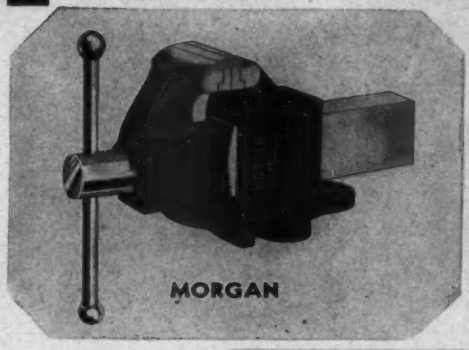
ABERDEEN SOUTH DAKOTA

ENGINEERED FOR SCHOOLS



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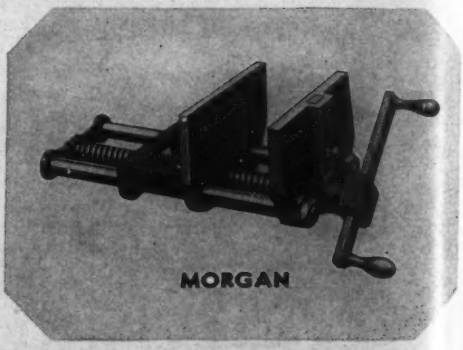
Unsurpassed for strength and durability. Supplied with stationary or swivel base and in various sizes.

CONTINUOUS SCREW AND QUICK ACTION VISE

Designed and built to withstand the most severe service. The extra heavy Cold Rolled Screw and Solid Bronze Nut will last a lifetime.



Write for complete information and prices.

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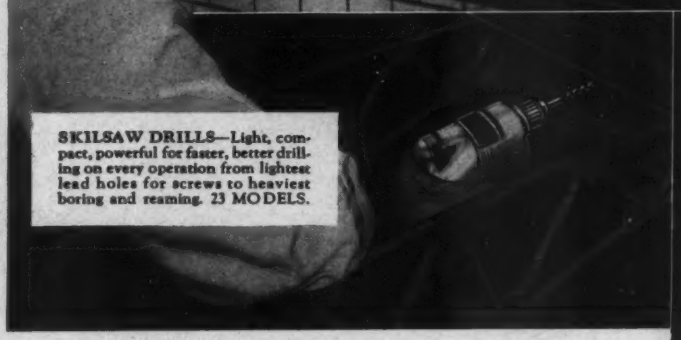
SKILSAW TOOLS

ARE IDEAL FOR INSTRUCTION!



SKILSAW DRILLS—Light, compact, powerful for faster, better drilling on every operation from lightest lead holes for screws to heaviest boring and reaming. 23 MODELS.

The wise way to train new workers is with industry's own tools and methods . . . *and that means* SKILSAW TOOLS! They're preferred in every field because they work faster, handle easier, get more jobs done in less time. So when your students are already adept with SKILSAW TOOLS, they'll make the shift to real production quicker in aircraft, tank and war material plants everywhere.

SKILSAW TOOLS are more powerful, but since they're lighter and more compact they make learning easier for your classes . . . *and help them do perfect work sooner!* Ask your dealer to demonstrate SKILSAW TOOLS *today!*

SKILSAW DISC SANDERS—Speed up all grinding, filing, metal cleaning, sanding, polishing and buffing on flat or curved surfaces of wood, metals and compositions. 3 MODELS.

SKILSAW BELT SANDERS—For all "final-finishing" on flat surfaces of all materials. Light, perfectly balanced for smooth, even sanding and polishing. Belt widths: 2¼, 3 and 4½ inches. 4 MODELS.

SEND FOR THIS FREE CATALOG! *It illustrates every tool in the SKILSAW line. Then ask your dealer to demonstrate these tools on the jobs you teach.*

SKILSAW, INC., 5035A Elston Avenue, Chicago, Ill.

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SKILSAW PORTABLE ELECTRIC TOOLS

★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★

FILES FOR PLASTICS

LESSON NO. 5 ON SPECIAL FILES FOR SPECIAL PURPOSES

PLASTICS . . . an immense world of industry is expanding under the steady development of this many-purpose material. Many compositions, with remarkable new strengths, are rolling out of the scientific and engineering laboratories . . . vying with aluminum, steel and other metals in the manufacture of thousands of products.

Plastics finishing and fabricating call for many shapes and cuts of files: Double-cut (Flat) for sprue and flash removal; Mill for smoothing; Round for reaming; Half Round for curves; Square, Knife and Pillar for notches and grooves; Three Square for corners and angles.

Degrees of coarseness are important, too. To overcome the tendency of many soft or "shreddy" plastics to clog the file, teeth must be well spaced and gullets rounded. For fast cutting and to combat the abrasive action of most thermoplastics, teeth must be hard and thin-topped to continue to provide sharp cutting edges as the tips wear down. Also, plastics files must have a "dry," instead of "oiled," finish.

There's much for the student to learn about plastics filing — not only in respect to selecting *The right file for the job,* but also as to correct use.

For instructors' teaching information, Nicholson will gladly answer any questions on files for plastics and on the Nicholson, Black Diamond and XF Swiss Pattern files most suitable for use on the various general types of this modern material.

FREE TECHNICAL BULLETIN. Also further free copies (as your staff may need) of *"File Filosophy"* which treats on files for plastics as well as on many other regular and special files for various metals and purposes. *"File Filosophy"* is the latest and most authoritative "text-book" of its kind.

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(Also Canadian Plant, Port Hope, Ont.)

NICHOLSON FILES *FOR EVERY PURPOSE*

NICHOLSON U.S.A. MADE IN U. S. A.

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

Vol. 32 OCTOBER, 1943 Number 8

Important — Changes of Address

On the Table of Contents page in the June, 1943, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION attention was called to the importance of notifying our circulation department if readers intended to change their addresses.

A goodly number of readers did this, but nevertheless, there were about 30 magazines returned as undeliverable, and a similar number of subscribers sent in their change of address after the September issue had been mailed.

With the present shortage of paper, press runs have to be calculated very closely. We would like every reader to get a copy of the magazine, but we cannot guarantee to have enough copies on hand to replace those that do not reach a subscriber who changes his address without notifying us in time.

While we are on this subject, may we have your district zone number, if you live in one of the larger cities. The post office may insist on having these put on our stencils shortly, and if every reader notifies us now, we will be ready when the time comes.

BUY MORE BONDS

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Editorial Contributions. — The Editor invites contributions bearing upon Industrial Arts, Vocational Education, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.

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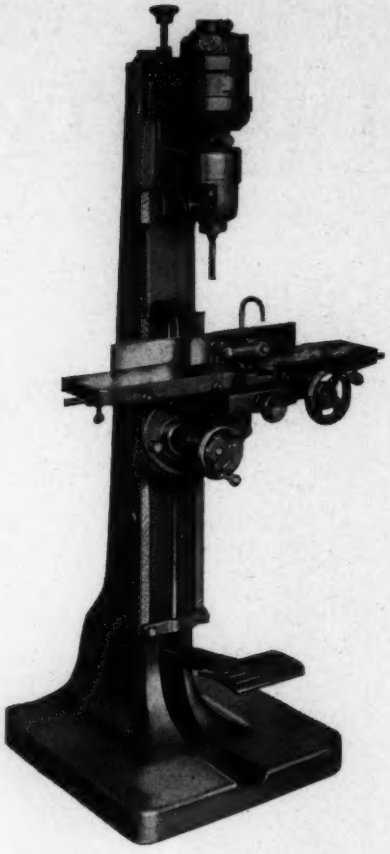


J-40 MORTISER

No. 47 of a Series

There's a right way and a wrong way to do everything. The right way is sometimes a little harder, takes a little more time, but invariably it is well worth the extra effort. There's a right way, for instance, to operate and maintain the J-40 Mortiser.

For one thing, it should be set up properly. Have the correct amount of clearance between the point of the chisel and the lip of the bit. Do not set the bit too close to the chisel. Be sure that the set screw in the bit chuck rests firmly against the flat part of the bit shank.

Keep the bit and the chisel sharp at all times. When sharpening the chisel, take care to maintain the original outline of the cutting edge. The cutting edge of the bit should be sharpened through the throat, and the side lips and spurs from the inside, never from the outside. Badly worn bits should be discarded.

This machine enjoys an excellent reputation for dependability. Give it the care it deserves.

YATES-AMERICAN MACHINE COMPANY • BELOIT, WISCONSIN

SHORT TALKS ON WOOD

BOX ELDER (*Acer negundo*)

A true maple, but is the only one of that family to have a compound leaf. For this reason it is often called the Ash-Leaved Maple. The wood is soft, light and weak. Not durable but is easily worked. Creamy white in color.

Is one of four species marketed under the name of "soft maple." Used in the manufacture of inexpensive varieties of flooring, woodenware, handles, furniture, boxes, crates and cooperage.

Distribution is general over that part of North America east of the Rocky Mountains. Grows rapidly under almost any conditions and in any location, but does best along streams and swamps. Because of its rapid growth and adaptability it is planted extensively as a shade tree, but there are many trees which are much superior for this purpose.

A medium-sized tree attaining a height of 30 to 50 feet and a diameter of 12 to 18 inches. The trunk is generally short, gnarled and twisted. Has a broad, open and unsymetrical crown.

The bark is pale gray or light brown, and is deeply ridged. The compound leaves have from 3 to 5 irregular shaped leaflets about 2 to 4 inches long and 1 to 2 inches wide. Dark green above, lighter below. Veins are very prominent. Like all maples, this tree bears double-winged seeds or "keys" in drooping clusters which remain on the tree until late fall.

YATES-AMERICAN

Construction of Written Achievement Tests

WILLIAM J. MICHEELS and M. RAY KARNES

(*Continued from page 274 of the September, 1943, issue*)

Matching

The matching type of test item includes two lists or columns of related topics such as words, phrases, clauses, or symbols. The student is required to match each item in one list with the item in the other list to which it is most closely related.

Examples:

Directions: In the two columns below are listed related words or phrases pertaining to fundamentals of radio. Place in the blank space in front of the word or phrase in the left-hand column the identifying letter of the word or phrase in the right-hand column which is most closely related in meaning. Use each letter only once. The first item is answered as an example. "J" is placed in the blank space because the "B" battery is the source of plate current.

(x)	J... Source of plate current	A. transformer
(61)	..... collects radio frequency waves	B. cathode C. coupling
(62)	..... changing an alternating current to pulsating direct current	D. capacity E. inductance F. impedance
(63)	..... controls the flow of electrons in a vacuum tube	G. antenna H. rectification
(64)	..... steps up weak radio frequency waves	I. grid J. "B" battery (do not use)
(65)	..... sources of electron emission in a vacuum tube	K. resistor L. reactance
(66)	..... controls voltage drop	M. plate
(67)	..... total possible electrons on a condenser	N. filtering O. choke
(68)	..... strengthens the resistance property of coils	

Directions: The following groups of words refer to gas welding. The first word in each of the groups is closely related to another word in the group. Underline the word to which the first word is most closely related. The first item is answered as an example.

(x) Gauge — hose, torch, pressure, tip
(1) Neutral — tempering, pressure, flame, annealing
(2) Carbon — brass, steel, aluminum, copper
(3) Annealing — plunging, hardening, tempering, softening

Directions: Listed below are two sets of related items referring to the principles of braking. For each item in the left-hand column select the item from the right-hand column that best matches it, placing the identifying letter in the blank space provided. *Use each item only once.* The first item is answered as an example.

x)	J... brake systems	A. excessive tire wear
(1)	..... mechanical brakes	B. should be driven in water
(2)	..... self energizing	C. at toe of shoe only
(3)	..... operates on propeller shaft	D. warped or scored E. rod or cable operated
(4)	..... major brake adjustment	F. wedging action
(5)	..... minor brake adjustment	G. cause for shimmy
(6)	..... unequal brake adjustment	H. heel and toe adjustment I. Delco
(7)	..... overheated drums	J. hydraulic and mechanical (do not use)
(8)	..... articulating links	K. mechanical brake L. will cause no shimmy M. Lockheed

Uses, advantages, and limitations:

1. The student's ability to recognize relationships and make associations can be tested readily with the matching exercise.
2. The matching exercise may require the student to match:
   a) terms or words with their definitions
   b) characteristics with the mechanical units to which they apply
   c) short questions with their answers
   d) symbols with their proper names
   e) descriptive phrases with other phrases
   f) causes with effects
   g) principles with situations in which the principles apply
   h) parts or mechanical units with their proper names, or
   i) parts with the unit to which they belong
3. A large number of responses can be obtained in a small space and with one set of directions.
4. It can be made totally objective.
5. It can be completed quickly by the student and scored quickly by the instructor.
6. It tends to be highly reliable and discriminating.
7. Since the phrases or clauses must necessarily be short, the matching exercise provides a poor measure of complete understandings and interpretations.
8. It is inferior to the multiple-choice item in measuring judgments and applications of things taught.
9. It is likely to contain irrelevant clues to the correct response. Difficulty is encountered in eliminating such clues.

Points to be observed in constructing matching items:

1. Require the student to make at least five and not more than twelve responses in completing each matching exercise.

2. Include at least three extra terms from which responses must be chosen. This tends to reduce the possibility of guessing or answering by a process of elimination.

3. Only homogeneous or related materials should be included in any one exercise.

4. Place the column containing the longer phrases or clauses on the left-hand side of the page. Require students to record their responses at the left of this column. This makes the process of selection easier.

5. In matching the parts of the item, each part should be used only once.

6. Include at least three plausible responses from which each correct response must be selected. If in order to do this it becomes necessary to include three times as many items in one column as in the other, use some other type of test item.

7. In setting up the test make sure that all of a given matching exercise appears on one page.

8. Use capital letters to label the parts in the column from which responses are to be selected.

9. List nothing in either column that is not a part of the subject in question.

10. Make the directions specific. State in the directions the area of instruction to which the things listed apply.

Classification

The classification type of test item requires the student to classify several terms, phrases, or clauses, and so on, in terms of certain definite categories. This and the matching type of test item are similar. They have essentially the same uses, advantages, and limitations. The same points should be observed in constructing them. The classification type can and should be substituted for the matching when several things listed in the exercise bear a definite relationship to other things listed. Many variations of this type of test item can be used effectively.

Examples:

Directions: Listed below are numerous parts of the .50 caliber HB M2 Browning machine gun. The lettered list that appears above the list of parts includes the names of groups of the gun. Indicate the group to which each part belongs by placing the identifying letter of the appropriate group in the blank at the left of the part. The first item is answered as an example.

Groups

(A) Bolt Group
(B) Cover Group
(C) Barrel Group
(E) Back Plate Group
(F) Barrel Extension Group
(G) Receiver Group

Parts

(x)	G bottom plate	(11)	..... guide
(1)	..... extractor cam	(12)	..... breech bearing
(2)	..... ejector	(13)	..... shank
(3)	..... barrel support	(14)	..... depressors
(4)	..... trigger bar	(15)	..... breech lock
(5)	..... buffer tube sleeve	(16)	..... striker
(6)	..... buffer disk	(17)	..... barrel locking spring
(7)	..... buffer plate		
(8)	..... belt feed pawl arm	(18)	..... chamber
(9)	..... cover detent pawl	(19)	..... piston
(10)	..... sear spring		

Directions: Listed below are numerous items of equipment used in the Army. The lettered list that appears above the list of items includes the various arms and services responsible for the procurement, storage, and issue of these items to other arms and services. Indicate the arm or service responsible for procurement of each item by placing the identifying letter in the blank at the left of each item. The first item is answered as an example.

A. Signal Corps
B. Medical
C. Ordnance
D. Engineer
E. Chemical Warfare
F. Quartermaster

(x)	A pigeons	(45)	..... cipher device
(38)	..... gas mask	(46)	..... rations
(39)	..... first-aid packet	(47)	..... tanks
(40)	..... tents	(48)	..... aircraft radio
(41)	..... truck, 2½ ton	(49)	..... electronic tubes
(42)	..... field telephone	(50)	..... bayonet
(43)	..... pistol	(51)	..... haversack
(44)	..... map measurer		

Directions: Listed below are several missions performed by artillery. The lettered list that appears above the list of missions includes the different phases of combat in which artillery is engaged. Indicate the phase in which each mission belongs by placing the identifying letter of the appropriate phase in the blank at the left of the mission. The first item is answered as an example.

Phases

A. Before contact has been made
B. When initial contact has been made
C. Exploitation of the enemy
D. Pursuit of the enemy

Missions

(x)	C	counterbattery fire
(18)	.....	harassing fire
(19)	.....	destruction of bridges
(20)	.....	interdiction
(21)	.....	successive concentrations
(22)	.....	fire on enemy reserves
(23)	.....	destruction of road blocks
(24)	.....	plan of fires

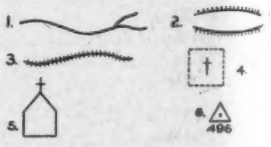
Identification

The identification type test item is used to measure the student's ability to recall and indicate the proper names of such things as tools, mechanical units, symbols, instruments, or specific parts. This type may also be used to measure the ability of the student to analyze special difficulties or identify the errors in a drawing.

Examples:

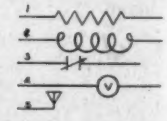
Directions: In the blank to the left of the symbols shown below, write in the name of the object represented by each symbol.

1. .....
2. .....
3. .....
4. .....
5. .....
6. .....



Directions: Below are sketched a number of electrical symbols used in radio circuits. In the blank space at the left of each write the correct name for the symbol.

1. .....
2. .....
3. .....
4. .....
5 .....



Directions: Listed below are a number of Signal Corps abbreviations. Write the item for which the abbreviation stands in the blank to the left. The first item is answered as an example.

(x)	Receiver	REC
(1)	.....	LS
(2)	.....	CS
(3)	.....	BX
(4)	.....	T
(5)	.....	HS
(6)	.....	CD
(7)	.....	MS
(8)	.....	MP
(9)	.....	TU
10)	.....	TM
(11)	.....	DM
(12)	.....	FT

Uses, advantages, and limitations:

1. The identification item can be substituted for the matching when it is desired to have the student recall outright the proper names.

2. It can be made to measure well the application of certain knowledges as in detecting the errors in a drawing, etc.

Points to be observed in constructing the identification test item:

1. Make all sketches clear and of sufficient size.
2. Make sure that lines indicating parts to be named terminate at proper places.
3. Wherever practical display the actual parts of units instead of using sketches.
4. If the actual parts or units are to be displayed, place the identification items at either the beginning or end of the test.
5. Have a good sample of the item to be identified.
6. Make sure that only one definite answer is possible.

Listing or Enumeration

The listing or enumeration type of test item requires the student to supply a list of terms, rules, or factors, and so on, that have been taught and emphasized in a given course. It is used frequently but is often abused. The student may or may not be required to list in a particular order the things called for.

Examples:

Directions: Read each item carefully. Follow in every detail the directions given with each.

In the blank spaces provided, list the *six aids* which are helpful in identifying objects or features on an aerial photograph.

(1) .....
(2) .....
(3) .....
(4) .....
(5) .....
(6) .....

List *in the order that they occur* the four strokes of the Otto cycle.

(1) .....
(2) .....
(3) .....
(4) .....

There are three things that will cause a grabbing brake with very little pedal pressure. They are:

(83) .....
(84) .....
(85) .....

The booster cylinder requires lubrication each 6000 miles and special attention must be given to kind of lubricant. The kind is:

(86) .....

Directions: List the chain of command from a squad to a field army, omitting the outmoded Brigade.

(1) ..... (5) .....
(2) ..... (6) .....
(3) ..... (7) .....
(4) ..... (8) .....

Uses, advantages and limitations:

1. The listing or enumeration test item can be used to measure the recall of highly specific points of information.
2. It allows a degree of freedom of expression.
3. It minimizes the problem of guessing the correct response.
4. Its use tends to place too much emphasis upon the memorizing of facts and details.
5. It does not measure readily the individual's ability to use or interpret the information taught.
6. Its scoring tends to become somewhat subjective.

Points to be observed in constructing listing or enumeration test items:

1. Design the enumeration item so that it will call for specific facts.
2. Each thing to be listed should involve only a few words. The student should not be required to list long involved statements. Scoring these becomes subjective.
3. Rarely should one question call for more than six or eight things to be listed.
4. Allow one point for each thing to be listed.
5. Do not try to use this item if the student can choose from a great variety of possible answers to supply the responses. That is, do not call for five things out of a list of fifteen taught in the course. To do so would place all students who listed five things in the same category and indicate that each had achieved equally with respect to the fifteen points in question. A student who had learned all fifteen things would receive, on this listing exercise, the same score as the student who had learned only five of the fifteen. Such a listing item would be very low in discriminating power. Every effort should be made to design items that will detect small differences in achievement.
6. If the student is required to list things in a given order, determine, before the test is given, how the responses are to be scored. There are at least six different bases for scoring a listing exercise of this nature. The nature of the subject matter should be considered in establishing a method of scoring.

Correct Order or Rearrangement

The correct order or rearrangement type test item requires the student to indicate the order in which items listed should occur. The list may include a few items in addition to those that are to be arranged in a certain order. If extra items are included, the student is required to do two things: (1) pick out the items that apply, and (2) arrange them in a given order.

Examples:

Directions: The steps required to tune the BC–223 transmitter for CW Master Oscillator operations are listed below. Number them to indicate the order in which these steps should be performed.

(27) ..... Select the antenna coupling switch position.
(28) ..... Turn the transmitter *off–on* switch to the *on* position.
(29) ..... Select the assigned frequency from the calibration chart.
(30) ..... Place the *tone–voice–CW switch* in the *CW* position.
(31) ..... Place the frequency control dial at the setting indicated for the assigned frequency.
(32) ..... Adjust the antenna coupling control to give optimum output.
(33) ..... Place the crystal selector switch in the *MO* position.
(34) ..... Press key and adjust antenna inductance control to tune antenna to resonance as indicated by antenna current meter.

Directions: The steps listed below are involved in an operation you have done on the front drive axle of the 1941 ½-ton Dodge. Place the figure 1 in the blank space at the left of the first step to be performed, then number of the other steps in the order that you should do them.

(68) ..... make position adjustment
(69) ..... adjust trunnion bearings
(70) ..... adjust wheel bearings
(71) ..... check steering stop angle
(72) ..... adjust blacklash
(73) ..... adjust pinion shaft end play
(74) ..... make end play adjustment
(75) ..... adjust thrust pad
(76) ..... adjust carrier bearings

Directions: Listed below are the various types of waves as they are classified by length. If they were listed from long to short their order would be different. Indicate the correct order by putting a 1 in the brackets beside the longest wave, 2 beside the next longest, and so on.

( ) Heat rays
( ) Infra-red rays
( ) Radio waves
( ) X rays
( ) Ultra-violet rays
( ) Cosmic rays
( ) Visible light

Directions: The terms listed below are used to classify files according to their coarseness. By placing numbers in the blanks, indicate the comparative coarseness of the six cuts of files listed. The numbers should range from the coarsest to the finest. Number the coarsest 1, the next in coarseness 2, and so on.

( ) Coarse ( ) Dead smooth
( ) Smooth ( ) Second cut
( ) Bastard ( ) Rough

Uses, advantages and limitations:

1. The correct order item may be used effectively to measure

the student's knowledge of the order in which steps should be taken in the performance of an operation.

2. It can be used to measure the student's understanding of the relative importance of certain points. Such items are difficult to construct.

3. It can be used to measure the student's ability to rank certain things according to a specified condition or basis.

4. Determining how the response should be scored or marked is a difficult problem. No one method is satisfactory for all correct order test items.

5. Unless one definite system of scoring responses is adopted it cannot be made totally objective.

Points to be observed in constructing correct order items:

1. Include not less than four nor more than twelve responses in a correct order test item. Do not try to measure the student's knowledge of a long involved operation with one correct order item.

2. Write a set of directions for each item. A standard set of directions cannot be used successfully for all items.

3. If extra steps are included when listing the steps in an operation, be sure to indicate in the directions that the student must do two things: (1) pick out the proper steps, and (2) arrange them in proper order.

4. In each instance use a system of scoring that will take off points in line with the number of errors made. Many instructors are inclined to give the student no credit if a single error is made. In doing so, all students who make errors, regardless of extent of errors, are placed in the same category with respect to the exercises; the student who gets one item out of order receives no more credit than the student who gets six out of order. For most exercises the following procedure is recommended. Allow one point for placing the first item first. Then allow one additional point for each item that is placed immediately after the item that it should follow.

Completion

The simple completion type of item requires the student to recall and supply one or more key words that have been omitted from statements. The words, when inserted in the appropriate blanks, make the statements complete, meaningful, and true. The statements may be isolated and more or less unrelated, or, they may be combined to form short paragraphs that carry a continuous line of thought.

Examples:

Directions: Each of the numbered blank spaces in the following incomplete statements indicates the place of an omitted word. Complete the meaning of each statement by writing the correct words (one word for each blank) in the corresponding numbered blanks at the left. The first item is answered as an example.

(x) Air The motorcycle engine is (x) ..... cooled.
(1) ..... When the motorcycle service lights are turned on the (1) .....
(2) ..... Furnishes additional current by cutting in a second (2) .....
(3) ..... The output of the generator can be increased by moving the (3) .....

Directions: In the blank space that occurs in each of the following incomplete statements write the word or words (one word for each blank) that will make the statement complete and true. The first blank is filled in as an example.

(x) ..... The breaker points open and close the primary circuit.
(1) ..... The ammeter is connected in .....
(2) ..... The cam angle is the number of degrees through which the cam revolves while the points are .....

Uses, advantages, and limitations:

1. The simple completion item can be used to test the student's ability to recall specific facts; it demands accurate information.

2. It can be used effectively to sample a wide range of subject matter.

3. The paragraph form can be used to test continuous thought along a certain line.

4. The completion item has high discriminating value.

5. It is difficult to make entirely objective.

6. Used indiscriminately, it tends to measure verbal facility and memorization of facts rather than application.

Points to be observed in constructing simple completion type test items:

1. Omit no more than three words in a given sentence. Leaving too many blanks makes it necessary for students to memorize entire statements. A short statement with only one word omitted is preferable.

2. Place the blanks near the end or at least past the center of the sentence. This makes for continuity when reading the statement.

3. Design each statement in such a manner that it will remain *incomplete* until the correct response is inserted.

4. Omit only key words. Make sure that the knowledge for which it is intended to test is omitted and not some insignificant or trivial word.

5. Do not copy statements directly from textbooks to make a completion item.

6. It is usually poor practice to omit verbs.

7. If possible, construct the item so that there can be only one correct response.

8. If synonyms are to be accepted, include them in the key.

Controlled Completion

There are several variations of the completion type test item. The simple completion item requires the student to *recall* certain information. The controlled completion is a variation that merely requires the student to recognize and select from a list of possible responses the correct answer for each blank. The controlled completion item has not been used extensively but is coming into more common use.

Examples:

Directions: In the statements below, certain key words have been omitted. The words or phrases that fit into the blank spaces are included in the lettered list that follows the statements. Select the word that best fits in each blank and place its letter in the appropriate space at the left. Use each letter only *once*. In some cases it may be necessary to choose the better of two possible answers. The first blank is filled out as an example.

(x) L The transmitter contains the tubes and circuits whic..
(1) ..... generate the x ..... power from the d.c. power furnished
(2) ..... by the 1 ..... or 2 ..... This radio frequency 3 .....
(3) ..... is delivered by means of the antenna lead to the 4 .....
(4) ..... where it is 5 .....
(5) ..... The receiver takes the small amount of radio fre-
(6) ..... quency power received from the antenna, and by means of
(7) ..... suitable 6 ..... and 7 ....., makes the original message
(8) ..... intelligible to the operator. It accomplishes two things.
(9) ..... First, the small amount of power received is 8 ..... to
(10) ..... a sufficient value and, secondly, the signal is 9 .....
(11) ..... or 10 .....; that is, the radio frequency is converted to an 11 .....

A. ground	K. dry battery
B. radiated	L. radio frequency
C. vacuum tubes	M. modulated
D. loud-speaker	N. amplified
E. oscillator	O. audible sound
F. power	P. audio frequency
G. detected	Q. dynamotor
H. storage battery	R. demodulated
I. antenna	S. headset
J. circuits	T. alternating current

Directions: Several incomplete statements are listed below. Each blank space indicates that a word or group of words has been left out. From the list given below the statements you are to select the word or group of words that will make each statement correct, and write the word or group of words in the blank spaces provided. Use each word or group of words one time only. The first blank is filled in as an example.

(x) A blown grease seal in a transfer case may be caused by a clogged vent.....
(68) The transmission countershaft main drive gear is driven by the.....
(69) On a propeller shaft, the yokes are mounted .....
(70) The yokes are mounted in this manner to prevent .....
(71) Steering stops are used to protect the .....
(72) Bearings that are adjustable are usually .....

speed fluctuation	differential
tapered roller bearings	constant velocity joints
a clogged vent	oscillation
in the same plane	the propeller shaft from moving
two-row ball bearings	reverse idler gear
transmission main drive gear	opposite each other
slip joint	

Uses, advantages, and limitations:

1. The controlled completion item can be used effectively to measure the student's ability to make close discriminations.
2. It is well suited to measurement along a continuous line of thought.
3. From a standpoint of scoring, it is totally objective.
4. It is very difficult to construct.

Points to be observed in constructing the controlled completion test item:

1. Observe the same rules pertaining to the number and selection of words to be omitted that were given for the simple completion type test items.
2. The list of words or phrases from which choices are to be made should include several extra words or phrases.
3. For each blank there should be listed at least three plausible responses but only one that is correct. If, in order to have three plausible responses, it is necessary to include three times as many choices as there are blanks, it will probably be better to use another type of test item for this particular subject matter.
4. If two blanks require the same word, list the word at least twice.
5. A word may be listed twice but used only once.
6. All subject matter included in a given controlled completion exercise should be related.
7. Include not fewer than five or six or more than fifteen blanks in any one series.
8. Make sure that the selection of the correct response for each blank depends upon knowledge of the subject matter in question. A poorly constructed exercise can usually be completed without such knowledge.

Situation

The situation type test item involves the statement of a problem or the description of a situation to which the student is required to respond. The problem is stated in such a manner as to require the student to make use of previous learning in order to arrive at the solution.

The situation test item differs from one variation of the multiple-choice item in that the former involves recall whereas the latter is a recognition type of item. The student has only to recognize the correct response to answer the multiple-choice question. The situation item is, therefore, the more difficult of the two and requires a more complete command of the subject matter.

The situation type test item may be designed in such a manner as to require the student to indicate his response by making a simple sketch, by completing a sketch included in the test, by completing an outline, or by writing out his response in narrative form.

Examples:

Directions: You have on your desks an aerial photo upon which you can locate Vine Grove Junction and CR at New Stithton. You also have a map (1/62500) of the same area. The photo has no scale indicated. Place the answers to the following questions in the blank space to the left of the question.

(35) ..... What is the distance in inches on the photo between the two points indicated above (air line)?
(36) ..... What is the ground distance between the two points (air line)?
(37) ..... What is the r.f. of the photo?
(38) ..... How long a line would be necessary to represent 2000 yards on the photo?
(39) ..... What is the grid azimuth from Vine Grove Junction to CR at New Stithton?

Situation: An enemy map with an r.f. of 1/1600 has come into your possession. You desire a graphic scale for this map in order to facilitate the scaling of distance.

31. *Requirement:* To find the length in inches of a graphic scale to read 3500 yards. (Show computations.)

Directions: Below are listed situations similar to those you will meet in combat. Indicate your solution to each problem on the blank space provided.

(1) A man that is 6 ft. tall measures 2 mils high. How far away is the man? .....
(2) On your first shot you fired 3 mils in front of a tank that is 1500 yd. away. How far in front of the tank did you hit? .....
(3) A telephone pole 30 ft. high measures 6 mils high. What is the range to the telephone pole? .....
(4) A tank 15 ft. long is 3000 yd. away. How many mils in length will it be? .....
(3) A medium tank 12 ft. high is 2 mils high. What is the range to the tank? .....

Directions: In each of the following situations give the proper class of fire which would be used with respect to the gun, target, and ground.

(1) The left flank of a target is 400 yd. from your gun position. The right flank of the target is 600 yd. from your gun position. The ground is level.
(*a*) Gun ..... (*b*) Target ..... (*c*) Ground .....
(2) The front of a column of troops moving to your right is 750 yd. from your gun position. The rear of the column is 750 yd. from your gun position. The ground is level.
(*a*) Gun ..... (*b*) Target ..... (*c*) Ground .....

Uses, advantages, and limitations:

1. It can be used effectively to measure the student's ability to make application of things learned. It is one of the most valuable items for this purpose.
2. It can be varied or adapted to various kinds of subject matter.
3. It is difficult to make objective.
4. Although highly valid, it is difficult to construct and score.

Points to be observed in constructing situation items:

1. Make the item as specific as possible.
2. Construct the item in such a manner as to require the student to reason or solve a problem. Require the student to make use of previous learning in solving the problem.
3. Methods of indicating responses will vary. Include directions for recording the response in the description of each situation or the statement of each problem. Do not attempt to write a set of directions that will fit all situations.
4. State the problem or describe the situation clearly and concisely. Use sketches wherever possible.

5. Avoid having the solution of one problem based on the response to another. If an earlier answer is wrong, answers to later questions are likely to be wrong.

6. Number each of the responses in the solution to a given problem and allow each response to count one point. If it is impractical to number the places for the responses on the test itself, number them on the key to the test.

Essay

In the essay type test item, the student is required to make a comparison, write a description, or explain certain points over which instruction has been given. Although it has been criticized severely, it can be designed to provide an effective measurement of certain important outcomes of instruction.

Examples:

Directions: Compare an up-to-date 1/62,500 topographic map with a photomap of the same area covered by the map and which is made up of recent photographs. Give the advantages and disadvantages of each. State under what circumstances in combat each would be more applicable as reference, and state the ways in which a photomap can be used to supplement the map. Be sure your name is at the top of each sheet handed in.

Uses, advantages, and limitations:

1. The essay item can be used effectively to measure the student's ability to organize and express thoughts.
2. It can be used to measure complete understanding of certain points.
3. Its greatest disadvantage lies in the fact that its scoring becomes subjective.
4. Response to the essay item requires much student time. Scoring the item requires much more time than required for other types.
5. Only a relatively small number of points can be covered by the essay item in a given test. A poor sampling of the subject matter results.
6. It provides the student an opportunity to "bluff."

Points to be observed in constructing essay test items:

1. Call for specific things. Word the item in such a manner as to provide the student with an outline that he can follow in formulating his response.
2. State the item in a simple, direct manner.
3. Allow one point for each significant point expected in the response. This, rather than the assumed importance of the item, should form the basis for weighing or assigning to it a value.
4. Design the essay item to require the student to "compare," "explain why," "give a reason," "describe," or "explain how" rather than to "name," "list," or "enumerate."

It is in scoring the essay type test item that great difficulty is experienced. Every effort must be made to keep the scoring of the item as objective as possible. In scoring essay items, the following points should be observed to insure maximum objectivity:

1. Write out the answer expected for each item. Include every point that is to be accepted.
2. Score one essay item on all the test papers before proceeding to the next.
3. Give value to an item by allowing one point for each point covered in the answer.
4. Conceal the students' names on the test papers, or in some manner make sure that their identity is not revealed. This is particularly important in cases where instructors have opportunity to become personally acquainted with students.

Several standard types of test items have now been presented. Instructors should be encouraged to adapt these items to the subject matter of their particular courses. These items can be modified to require the student to employ various means of indicating responses. Recall types of items can be designed that require the student to make sketches, complete incomplete sketches, fill in tables of data, identify parts and units displayed before the class, and so on. Recognition types of test items can be designed that require the student to detect and record errors in certain prearranged situations, or observe and indicate the errors made in the performance of operations.

It should be mentioned again that written tests enable us to measure certain important outcomes of instruction but not all of them. Other techniques such as the performance test and close observation of students at work must be employed in an effort to evaluate more fully the results of instruction.

Does Teacher Training Do The Job?

LIEUT. COMDR. C. C. CAVENY*

How helpful, really, is an in-service teacher-training program?

This is a question frequently asked of us since it became known that such a program was in operation at the Naval Air Technical Training Center, Navy Pier, Chicago.

It is a question that we asked ourselves many times in the months prior to its installation at our training activity.

Now that there is opportunity to evaluate results, we can say that our teacher-training program has been very helpful in three outstanding respects. First of all,

It has helped to achieve effective standardization of instruction.

Just as the trade recognizes and sets down for the schools what the journeyman must be able to do, so, too, the Navy made clear what it expected of the petty officers graduated from Navy Pier. How to achieve such a product with the equipment available and with hundreds of instructors of widely divergent experience was no small problem for the administration.

We might have allowed the instructors themselves to prepare the shop and class manuals that would standardize instruction. Or we might have set up a staff to write the manuals and hand them over to the instructors for use.

It was thought more practicable to work out a combination of these two approaches, in which the teacher trainers, under an instructional co-ordinator, would work with the instructors in preparing the manuals. Each group had its special contributions to make: The instructors offered firsthand acquaintance with shop and class situations, made critical evaluations of job procedures, and provided initial drafts of the material; the teacher trainers contributed familiarity with educational problems and research methodology and proposed sound textual organization and standardized format.

Preparing Shop Manuals

This is the way the combination worked in the preparation of one text — the shop manual for hydraulics:

1. A teacher trainer met with the superintendent of the aviation machinist's mate school, the supervisor of the hydraulics section, and several hydraulics instructors. The men discussed the objectives set up by the Navy for maintenance and repair of hydraulics systems and units, and they analyzed the equipment available to the hydraulics shop to determine what jobs could be performed by the trainee to accomplish those objectives.

*Naval Air Technical Training Center, Navy Pier, Chicago, Ill.

The key question was, "Exactly what jobs must we set up in the shop to accomplish these objectives?"

2. Hydraulics instructors were assigned to write the first drafts of the jobs for which their experience best suited them — each in collaboration with the teacher trainer, who checked Navy specifications and advised concerning organization of contents, style, and phrasing.

3. Typewritten copies of all jobs were distributed among the instructors, who tested them with their trainees, recommended revisions, and returned the job sheets to the teacher trainer.

4. The revised manual was submitted in turn to the hydraulics supervisor and the director and superintendent of the aviation machinist's mate school for their approval.

5. The teacher trainer then handed over the approved manual to the publications director for duplication in tentative, mimeographed form.

After a trial period, during which instructors and trainees have been making active use of the hydraulics manual, it will undergo whatever changes are recommended and the publications director will produce it in final lithographed form.

The shop manual for each unit of instruction contains the jobs that must be performed within that unit. Every job sheet includes the following:

1. Job title
2. Objectives
3. Time requirement
4. Tools and equipment
5. Materials
6. Procedure

The procedure is not simply an outline of what is to be done; it explains in adequate detail just *how* it is to be done. References are supplied wherever it is thought profitable to include them.

With the shop manuals as a working basis, teacher trainers and instructors developed related materials for the classroom, using the same procedure as was employed for the shop jobs. The key question now was, "What must we teach the man in the classroom to prepare him for his work in the shop?" Each classroom topic was written to give the trainee what he needed to know in order to do an intelligent job in the shop. Classroom topics and shop jobs were thus interrelated; for example, the job, "Make and install a hydraulic fluid line," in which the student removes a damaged portion of the line and replaces it with new tubing, is preceded by the topic, "Fabrication of Tubing," in which the trainee learns the steps in bending, flaring, fitting, and installing the correct size and type of tubing.

Each topic in the classroom manual includes the following:

1. Title
2. Objectives
3. Time requirement
4. Instructional content
5. References

The classroom manual is designed rather to fix for the instructor *what* he should teach than to tell him *how* he should teach it. He is required to prepare his own lesson plan from a skeletal outline given to him by the teacher-training department, which includes the following headings:

1. Title
2. Objectives
3. Time requirement
4. Instructional aids
5. Teaching methods
6. Motivation
7. Means for securing trainee participation
8. New terms and definitions
9. Subject matter (from the classroom manual)
10. Summary
11. Methods of testing
12. Assignment
13. References

With the shop and class manuals as a basis, manuals for the trainees were prepared to serve as a condensation of the unit of instruction. They are lithographed booklets which contain essential information, outlines of job procedures, diagrams, tables, and illustrations. The trainee uses them as texts while he is in school and for reference after he has graduated.

This method of standardizing instruction — through the use of accepted textual materials prepared under the direction of a teacher-training staff — has had definite advantages which may well be enumerated:

1. It was a democratic way of handling an educational problem, with all the concomitant gains and little, if any, waste of time.

2. Among these gains was the fact that, in the process of standardization, there was no stifling of the teacher's initiative. The part he played in the development of the manuals made them his own.

3. The teacher's attention was focused on his own instructional problems, and he was stimulated to suggest solutions of these problems.

4. Textual materials were acquired which met to the letter the needs of the school.

5. Because all these materials passed through the hands of the teacher-training staff and of the publications director, there was a uniformity to them that otherwise could not have been achieved.

Upgrading the Quality of Instruction

We come now to the second major contribution made by the teacher-training program to our activity:

It has definitely done the job of upgrading the quality of instruction at Navy Pier.

The teachers themselves are as ready as anyone on the station to underwrite this statement. In an unsigned questionnaire submitted by the first 150 instructors to participate in the upgrading program, 87 per cent felt that it was of real value in improving their teaching efficiency. More than 78 per cent asked for an extension of the program to undertake more specialized work.

These percentages become more significant when one realizes that many of the teachers at Navy Pier have had years of experience in their profession. They suggest that any faculty can profit from an upgrading program, no matter how proficient its members may be.

The program of teacher training at Navy Pier has progressed along two principal lines. The first is a four-week course of twenty 50-minute sessions covering basic teaching techniques. Each trainer meets approximately twenty instructors and they discuss, conference style, such topics as the qualities of a good instructor, the conduct of shop activities, planning and presenting a lesson, oral questioning and discussion, the conduct of demonstrations, the use of motion pictures and film strips, making, administering, and using tests, and maintaining good discipline.

Every attempt is made to confine all discussions to topics of practical value. Bases for conference sessions are a manual, prepared by the instructional co-ordinator and a member of his staff, and pretests developed by the department for each of the topics listed in the foregoing. That the instructors have liked both sets of materials is indicated in these facts: Almost 96 per cent were in favor of the pretests in so far as they suggested main topics for discussion; 91 per cent felt that a thorough study of the manual would help them in their teaching.

The second method of upgrading practiced by the teacher trainers has been the observation of instructors at work in shop and class. All instructors on the Pier are being visited at least five times in their classes and at least three times in their shops by the trainers, each of whom has a definite number of men assigned to him. Evaluations of shop and class performance are recorded on upgrading memoranda which list important points of observation with regard to personal qualities, class and shop instruction, and classroom and shop management. The instructor is given copies of these memoranda during a private conference in which he and the trainer go over his performance record. The set which the trainer keeps is filed by the department and brought out for comparative purposes when the trainer makes his next series of visits.

The instructors who have already participated in this phase of the training program have welcomed it strongly, principally through a sincere interest in the quality of their teaching and through a desire to use constructive criticism toward self-improve-

ment. Many of those who await it have expressed a desire to have the trainers visit their classes ahead of schedule.

Building Morale

A third contribution of the teacher-training staff:

It has helped to boost faculty morale.

One of the objectives of the teacher-training courses has been to serve as a clearinghouse for all problems of an instructional nature. This objective has been particularly important because of the size of the faculty and the difficulty of an individual instructor's making himself heard. More than 92 per cent of the teachers who have completed the course have indicated that they felt free to bring their instructional problems to the conference for discussion and possible solution. In those cases in which the teacher-trainer was not empowered to correct an unsatisfactory situation, he informed the group that he would pass the problem on to those who could. The effect has been to make the administrative staff more fully cognizant of justifiable complaints by the instructors and to remedy those situations wherever possible; on the other hand, it has brought the instructors to realize that not all their difficulties admit of easy solution and that the administration is doing all it can to make their instruction easier and more efficient.

As a result, 86 per cent of the teachers now feel that the teacher-training work improves relationships among members of the faculty and the administrative staff.

* * *

We are not unmindful of the fact that a teacher-training program depends for its success upon the quality of performance of the men who conduct it. This article is written to show that in-service teacher training *can* be successful; we hope that it will stimulate those now handling such programs and that it will encourage others who have been considering their introduction.

The Quartermaster Department Trains Its Instructors

CAPT. THOMAS S. GWYNN, JR.*

In order to achieve and maintain the high standards prescribed for supply training, the Quartermaster Replacement Training Center at Camp Lee, Va., is seeking constantly and persistently to improve the quality of the instruction in its technical schools. With full realization that the success of its program will be determined largely by the effectiveness of its instructor personnel, every precaution is taken to select only those men whose qualifications as to background, aptitudes, education, and civilian and military experience are well adapted to such assignments.

In October, 1941, the Supply Training Instructors School was established to afford all instructors comprehensive and intensive training in the foremost pedagogical procedures so necessary to effective army instruction. Each complete course is of two weeks in duration, and is so arranged as to meet the specific, practical needs of both experienced and potential instructors.

Data submitted on classification and similar forms have shown the heterogeneous character of the 325 students who have attended the school to date. Many are only high school graduates. A smaller number hold degrees from colleges and universities, while a larger percentage have attended vocational or special service schools. Oddly enough, only approximately 6 per cent have had teaching or related professional experience prior to entering the army.

The curriculum of the school has been revised frequently to meet the special and varying needs of individuals in the group, and it has been necessary to introduce many seemingly elementary subjects such as "Skill in Taking Notes," and "Methods of Outlining." However, despite the continuous readjustment and revision of the subject matter presented, a definite standard of proficiency and of performance has been maintained throughout, and should a student fail to meet such requirements, it is recommended that he be assigned elsewhere. Initial emphasis in the course is directed toward the development of a deeper consciousness on the part of each student of the vital role he is playing in the war effort. By means of directed class dis-

Explaining handicaps in speech which beginning teachers should overcome

*Supervisor, Supply Training Instructors School, Quartermaster Replacement Training Center, Camp Lee, Va.

cussions, the personal and professional qualities of a good instructor are indicated and discussed at length. The value of training aids in reinforcing and clarifying significant points, the methods of instruction, the mechanisms of instruction, lesson planning, the technique of questioning, supervised study, the proper construction of tests and examinations, and many other professional subjects are presented in a logical and sequential manner.

Constant reference is made to the necessity for the adequate preparation of the student to learn by appealing to psychological and other factors which are general in application. Finally, in order to keep the stark realism of the war in the forefront and to so apply the subject matter as to achieve the paramount aim of military instruction — victory in battle — a course entitled "Principles of War" is included in the schedule.

Ample opportunity is given to each student to actually demonstrate his ability to speak and teach. All members of the class are required to give one or more impromptu speeches during the two-week period, and such experience has proved invaluable, in many cases, in overcoming stage fright and in developing confidence and self-assurance in potential and inexperienced instructors. Public-speaking analysis charts are distributed to each member of the class, and each speaker is evaluated on the basis of ten qualities which are considered the obvious attributes of any effective speaker. One member of the staff of the Instructors School will guide and direct a detailed and constructive critique of the performance of each speaker, and conspicuous weaknesses and errors are called to the attention of each successive speaker in order that he may correct them in a future performance of a similar nature. Embarrassing mistakes and handicaps common to beginning teachers are thus made and corrected before the new instructor faces a group of trainees in the particular school to which he has been assigned.

A surprisingly large number of each group suffer from anthropophobia, and the tension and apparent nervousness exhibited by such speakers is often so intense that they are momentarily incapable of speech. Practical advice is given to aid in the overcoming of such a phobia. The most advantageous and "easy" positions on the platform are stressed, and the inspiration that a speaker may derive from his audience is emphasized so as to develop poise and confidence in speakers so handicapped.

The striking case of Corporal X serves as an excellent illustration indicative of the need for such training. Corp. X had had no previous experience in teaching or speaking. When requested to make an impromptu speech of five minutes duration, he hesitantly and unwillingly proceeded to the platform, where he consumed a full minute in writing the title of his speech and his name on the blackboard. At length, he faced the class, but finding that task entirely too distracting and too demanding, he once again turned his back to the group. Ever conscious of the ordeal ahead, he managed to state his subject and introduce himself before he finally abandoned the platform in complete confusion. The class, guided and directed by pertinent suggestions from an instructor, carefully analyzed the reactions of Corp. X on the platform. In a second impromptu speech during a later period, Corp. X showed marked improvement, and in a third performance he exhibited an assurance of manner and a resourcefulness of speech which were totally lacking in his first attempt.

In addition, each student is required to give one or more practice teaching lessons, choosing subjects which he has been presenting or which he is to present in his own school. Analysis charts are distributed to each member of the class, and, not only are the personal qualities of each teacher observed and criticized by the class and two instructors, but, similarly, his instruction is evaluated on the basis of ten additional qualities.

All suggestions made are constructive in nature and are designed to eliminate the recurrence of the errors and weaknesses noted by making each teacher aware of their existence and by indicating the most logical means of remedying them. Such factors as the preparation of the students to learn, the motivation of the students, the organization of subject matter, the methods of instruction employed, the control of the class, and the use of visual aids are emphasized and discussed in detail. Such critiques are highly beneficial to both experienced and inexperienced teachers.

Experienced teachers become conscious of minute weaknesses, and certain aids to instruction are recalled to their minds which have escaped their attention for a long period of time. Inexperienced teachers can determine the effectiveness of their teaching before they actually present a lesson in their own schools, and consequently, they can concentrate on the correction of all defects displayed in the presentation of their first lesson.

Potential instructors are selected on the basis of their knowledge of the technical subject matter. In many instances it is shown, however, that this quality is not sufficient to guarantee successful teaching. The instructor must have certain personal and professional prerequisites to supplement mastery of the subject. For example, Sergeant Y displayed a thorough and complete comprehension of his subject, and yet, due to his failure to outline his material logically and to organize his points coherently, the class gained little information from his lesson. Rather than adhering to the desired sequential development of the pertinent points in the lesson, he tended to ramble in a discontinuous and disorganized manner. As a result of the criticism and suggestions offered by the instructor and various members of the class, it is not likely that Sergeant Y will again disparage the necessity for outlining his subject regardless of the extent of his knowledge of the material to be presented.

Sand table used as a training aid at the Quartermaster Replacement Training Center, Camp Lee, Va.

In recognition of the fact that technical instructors are basically soldiers and then teachers, a program of basic military instruction is pursued two hours daily. Competent instruction, supplemented by well-chosen training films render this phase of the school activity practical and beneficial to all concerned. Student initiative and ability are displayed, since all members are given an opportunity to conduct military training for a brief period of time. All methods of instruction at the disposal of the army instructor are used to advantage in basic military instruction, and association of subject matter — basic and technical — is indicated whenever possible.

The accomplishment of the mission of the Supply Instructors School will go far in assuring the achievement and maintenance of the high standards set for supply training. Under the command of Brigadier General Guy I. Rowe, the school is directed by Colonel John V. Rowan, and is supervised by Captain Thomas S. Gwynn, Jr.

More About Vocational Guidance

A. P. TWOGOOD*

So much has been written and spoken on the subject of vocational guidance it is small wonder that educators and young people alike have become utterly confused and discouraged. One prominent educator has said that vocational guidance below the college level is a waste of time. If this is correct then about 85 per cent of our young people would receive no vocational guidance whatever. Another has said that vocational guidance on the adolescent level is positively harmful because parents and high school teachers are incompetent to give vocational advice.

To avoid argument let us assume this statement to be correct. The fact remains that, competent or otherwise, parents and teachers always have given vocational advice, and always will. Isn't it a wiser course to assist these parents and teachers in improving the vocational advice which they give?

Still another educator writes disparagingly of the "Horatio Alger" approach to guidance and states definitely that there is "no frontier to be pioneered." It is true that frontiers in the old sense of the word have disappeared but pioneering continues in new fields. There are frontiers in medicine, in science, in industry, in education, and in political science. In fact there are frontiers in every field of human endeavor, and the lowly worker who helps to get a new process into production in industry can be classed as a pioneer. What greater challenge can be found than that of devising a world order which will enable all to live in peace? Progress means change, and change requires pioneering.

In the cold statistical approach to vocational guidance the "Horatio Alger" concept has little place but there are some who doubt the wisdom of leaning too heavily on such statistics. The fact that only 6.5 per cent of the workers of the United States are in the professions will neither encourage those who should enter, nor discourage those who should not.

The "Alger" concept has entered into the life of every successful man and woman. These people were not born successful but early in their lives someone struck a spark of interest which was fanned into a driving force for the good of society. They saw something which needed to be done and proceeded to do it. It seems to this writer that the successful vocational guidance counselor must have considerable "Alger" blood in his veins in order to inspire those with whom he comes in contact. One cannot read of the work of Angelo Patri in New York, of Emily Griffith in Denver, and others, without sensing the tremendous amount of inspiration and guidance "a la Alger" which has been passed on to their students

In an attempt to clarify our thinking on the subject of vocational guidance let us start at the bottom and develop, step by step, some concepts fundamental to an understanding of the subject.

1. *The purpose of schools is to prepare young people for participation in adult society.* We may roam far away from this objective but we always return after sober reflection.

2. *Adult society is getting more complex with each generation.* One has only to compare the present with a few years ago to realize the increase in complexity of our problems.

3. *The major portion of an adult's waking hours is spent at work of some kind.* No one has yet devised a formula for living successfully and happily without working.

4. *Man's job is the foundation upon which are built a happy family life, character, health, citizenship, leisure, and social standing.* Destruction of this foundation, through loss of job, destroys the whole normal structure.

5. *Jobs are lost through maladjustment of the worker.* Some authorities estimate that 50 per cent of adults are misfits of one kind or another.

6. *Since the major portion of an adult's time is spent at work, preparation for successful participation in the work of the world is fundmental.* Preparation requires that the individual give some thought to what he expects to do.

7. *Preparation consists of two types of education: general and specific (vocational).* While the two types of education are named separately they are in fact inseparable as both point to the same objective, namely, successful participation in society. This writer prefers to think of vocational education as one phase of a complete program of education.

8. *General education lays the foundation in fundamentals with respect to interests, attitudes, ideals, abilities, and knowledge of basic content of various courses.* A well-rounded educational background is essential to understanding of the problems of modern society.

9. *Upon this foundation vocational education builds the specific interests, attitudes, ideals, and abilities which are necessary for successful participation in society as a worker.* Such training should be broad enough to supply experiences and information in a number of related fields, yet intensive enough to prepare for a specific field.

10. *Vocational adjustment is dependent upon:*

a) Vocational guidance
b) Vocational training
c) Placement and follow-up

Complete adjustment may require repetition of these steps.

11. *Helping young people to find those fields of work in which they can be most efficient and happy is specifically the problem of vocational guidance.* Growing out of the vocational guidance problem are many forms of guidance such as educational, health, character, social, etc., all dedicated to adjustment of the individual to the requirements of adult life.

12. *Vocational guidance may be broken down into three major steps:*

a) Pupil Analysis. Helping the individual to establish a personal pattern or profile which most nearly represents him.

b) Occupational Analysis. Establishing a pattern or profile for each occupation studied.

c) Counseling. Assisting the individual

*Associate Professor, Vocational Education, Iowa State College, Ames, Iowa.

in matching occupational patterns with his personal pattern to find those fields of work in which he is most apt to be successful.

13. *Most occupational patterns tend to be "fixed."* Few jobs can be altered to fit the individual. The common practice is to replace him with one better adapted to the requirements of the job.

14. *Preparation for a specific occupational field means adapting or adjusting the individual to the job.* This includes the development of desirable attitudes and ideals, as well as acquiring required knowledge and skill.

15. *Some human traits are not adjustable, thereby eliminating some occupational fields.* If the occupational field requires too many personal adjustments its selection may be very unwise.

16. *There are basic traits more or less common to all occupational fields which are just as necessary for success as specific traits.* Ability to get along with people, to work harmoniously in a group. The development of these traits belongs to the program of general education.

17. *Young people, and adults, change their minds.* The training in self-analysis, analysis of occupations, and planning of an educational program will be of material assistance in planning a new educational program if conditions so require.

18. *Young people and adults lose their jobs and must make readjustments.* The ability to make these readjustments is largely a measure of the broadness and success of their guidance and training.

19. *One who has been trained in the principles of vocational selection should meet such emergencies with greater confidence than those not so trained.* If this principle is incorrect then education in all of its phases fails to function.

20. *Vocational guidance cannot function perfectly because of the human factors involved.* Only time can prove the effectiveness of a guidance program. However, there is much evidence of improvement over the years. Careful research and new devices are making the work of the guidance counselor more effective. Our young people have had a defeatist doctrine preached to them from all sides. How can they be expected to "keep their chins up" if we as educators fail to point the way?

What Shall We Teach When the War Is Over?

GEORGE K. WELLS*

We are always interested in knowing about the future. If the present and past help us to predict the future probably a review of some facts as shown in the past will help us to get a look at the future.

Industrial and vocational education has been pushed to the front in this war as never before. If this educational group intends to serve in peacetime as well as it is serving during the war, it will be necessary for them to analyze the problems of the postwar world in terms of what people will be doing.

Schoolmen in general have looked with great pride on the machine-shop and welding equipment furnished them by the Federal Government, and have visioned the possibility of a training program using this equipment after the war. While this equipment can be made use of, there are many other trades that need to be served.

During this period great stress has been laid on machine-shop work, welding, radio, and aircraft. Those trades that do not contribute in a big way to the war effort have been left without emphasis. This will leave a gap in the ranks of many trades.

An ideal situation for placing students and keeping the proper number of trainees in the trades would be to know how many people are needed to fill the ranks of each trade each year. If we could know something about the number needed it would help a great deal. We have had census figures since 1860, taken every ten years. A study of these records yields considerable information that should throw light on the problem.

The author has charted the number in each trade, every ten years, since the figures were available. A comparison and study of these charts yields much information about trends in an occupation and makes it possible to predict with some accuracy the trends for the next ten years.

Before we go into the matter of how many people can be used in each trade, let us look at the picture from another angle. In all guidance and shop selection we have to consider the element of choice by the student, the availability of training courses, and the inertia of educational directors when it comes to keep a step ahead of the program as developed through the past years. The selection or choice by the student is conditioned by his or her surroundings. If the program of the school is narrow the student will have little from which to choose. The reason is sometimes given for the large number of people who selected teaching as a vocation after going to school in southern Indiana is that the teacher was one of a limited number of professional people that the students came in touch with. As the curriculums are enlarged the possibilities of other choices are revealed.

In the large cities the opportunity to see something of a variety of occupations and a greater variety of offerings in education helps to enlarge the horizon of the student. The more factual data available, the better the counselor will be able to give suggestions, and the better the school can provide training facilities for work as it is. All too often schoolmen put in courses because others are doing it. They do not base their action on factual data but on keeping up with the other cities. The writer fears that many school directors and superintendents seeing a large amount of machine-shop equipment in other schools, will feel a lot of similar equipment should be purchased for their own schools. They will perhaps fail to see that the extensive machine-shop equipment was secured to serve a period that will pass to some extent with the end of the war and that greater emphasis should be put on the other occupations that will contribute to postwar development.

Many people are looking for radical changes in building construction, in equipment for the home, and in other fields. In spite of all these changes it is our belief that the fundamentals of the various occupations and trades do not change. The change in emphasis is on the product and not on the principles back of the occupation. It is these fundamentals that will always be taught. The change in emphasis will be on the product. Schools training electricians should still continue to teach the principles of electricity but by applying them to new products. The engine mechanic, either auto or airplane, will need the same principles as before, but with emphasis on the new engines and new ap-

*Equipment Supervisor, War Production Training Division, Indianapolis, Ind.

plications. The schoolmen who carry on without making contact with the new products will be behind in their teaching techniques.

The problems of the supervisory staff will deal with the kinds of trades to be taught. This group must use past history and present facts in order to properly evaluate this problem. Here are some of the questions that should be asked.

How many people can be used locally in each of the various fields? How shall we set up the courses? Through day trade schools, evening schools, or part-time schools?

What evidence have we as to the number needed in each field?

When we have such facts how can we apply them to the problem?

How far can we figure ahead on such a program?

A study of the census figures plus an analysis of the prevailing conditions should give a pretty good picture as to how many people can find employment in a given field. Let us use an example:

The census figures show that over the country or in any given city there were a given number of machinists employed at each census period. If the figures be divided into the total working population, we have the number of machinists per thousand workers in the country, and in any given city.

A study of the curve of machinists shows that in 1920 there were more per thousand workers than in 1930. There is ample evidence to show that in 1920 figures were influenced by World War I and that in 1930 it had dropped back to a peacetime level. A study of all census figures shows that the number of workers in any field does not vary a great deal, if we figure the number in that field per thousand workers in all occupations. We, therefore, can secure a fairly accurate number per thousand workers for any given city.

Of course these figures should be weighted by an analysis of the industries of the locality as to whether the particular industries of that city are or are not increasing their use of this particular kind of worker.

Some occupations over the entire history as recorded by census figures have not changed more than one per thousand workers. Others have increased the number per thousand, but there are plenty of self-evident conditions to show why this is happening. Barring wartime conditions, the possible rate will not vary greatly.

The number of electricians in 1930 was seven per thousand workers. This was an increase of 111 per cent between 1910 and 1930. We can probably state that this figure will continue to increase after the war. We can reasonably conclude that there will be more than seven electricians per thousand workers.

The number of plumbers, gas and steam fitters was five per thousand workers in 1930. An increase from 1910 of 101 per cent. Whether there will be an increase in this figure is however debatable. If there is a building boom, the number may increase, and because there have been very few trained during the war period there may be need for training more than five per thousand workers. The evidence would indicate that five to seven would be enough.

There were four blacksmiths per thousand workers in 1930 which was a drop for the period of 1910 to 1930 of 44 per cent. Can any of us see any evidence that this number will increase? There were two draftsmen per thousand workers in 1930, an increase of 229 per cent in twenty years. Will this number increase in proportion or fall off? Certainly there would be only two or three per thousand at the most. There was one per thousand workers who were upholsterers in 1930, an increase of 243 per cent in twenty years. What can we expect here?

There were 24 carpenters per thousand workers and the percentage increase in twenty years was 0 per cent. Evidently we had about the right proportion for that period.

Suppose we compare the number in each of these fields:

27 Machinists per one thousand workers
24 Carpenters per one thousand workers
7 Electricians per one thousand workers
5 Plumbers per one thousand workers
2 Draftsmen per one thousand workers
1 Upholsterer per one thousand workers

From this table alone we might think that we need to train four machinists to one electrician and twelve carpenters to one draftsman. Let us remember that machine work has been stressed during the war more than electricity and that there will be a great surplus of machinists, or partly trained machinists, after the war. In the electrical field we have, however, a smaller number trained and the possibility of a greater number needed during the years to come.

Let us also make another comparison with these six trades as examples. The emphasis on types of work in the day trade school should probably be in serving the larger group numerically. We would hardly need courses in upholstering in the day school but we might need an evening course. We need not plan to train as many draftsmen as electricians. The emphasis should undoubtedly be on the occupations that need the most trainees with less on the group that are fairly small. The smaller groups can be served by evening or part-time schools as needed.

Census figures are available for all fair sized cities. It is, therefore, perfectly possible to trace down the individual city records and find whether that city differs from the average in any particular trade, or occupation.

Industrial Arts Laboratory, Chicago Public Schools. Dr. Louis Newkirk, Director, Bureau of Industrial Arts

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION
John J. Metz, Editor

Fire Prevention Week

On August 30 President Roosevelt issued a proclamation designating October 3 of this year as the beginning of Fire Prevention Week.

In this proclamation he called attention to the fact that the fire losses in the United States since Pearl Harbor have caused as much damage as that caused by the bombing over England during the first two years of the war.

This ought to make every one of us realize that the destruction caused by these fires is just as detrimental as if it had been caused by enemy bombers or by other enemy action.

In answer to our President's request, everyone ought to do his utmost to reduce this wanton destruction. The shop teacher especially has an opportunity to impress his students with the necessity of paying strict attention to avoid all fire risks, and to do their utmost to prevent the dangerous fires which cause losses that are frightful even under normal conditions but which are now positively criminal considering that the waste thus produced reduces materials and supplies needed right now to carry on the war. The sad part of it all is that many of the things so needlessly destroyed are no longer available, and cannot under present conditions be replaced.

The seven recommendations contained in the article on "Fire Prevention" on page 326 of this issue are quite applicable in a short talk on the subject of fire prevention. These recommendations are as adaptable in an industrial plant, an office, a store, or in the home, as in the school shop. They may well be used as an entry wedge into a further discussion emphasizing greater care in avoiding fire risks and dangers.

That Problem of Conserving Sight

Industrial shops have made great strides in enforcing general safety measures, but many are still far behind when it comes to insisting on proper care of the eyes. From a study covering fifty typical plants employing about one hundred sixty-seven thousand workers, it was found that at least 25 per cent of the employees had defective but corrective vision.

It was also found that few plants paid any attention to determine what visual requirements are necessary to qualify a worker for a particular job, and few of the personal records show whether a man is color blind or whether he has deficient depth perception. Then, too, less than one fourth of the plants mention the illumination at the scene of an accident. This leads one to believe that probably many of the general accidents are due to poor eyesight, or to poor illumination or to both.

All too many plants do not even provide goggles to workers on hazardous jobs, and too often the only pair of goggles in a shop is the one lonely pair hanging on a nail near the grinding wheel.

According to all indications, the grinding wheel is the only dangerous piece of equipment in these shops. The fact that serious eye accidents have happened on drill presses, boring mills, lathes, shapers, planers, and other power machines, seems to have been entirely overlooked. Operators on the machines just listed ought also to have their eyes protected, preferably with goggles which have specially fitted (prescription) lenses.

This information, culled from a release issued by the National Society for the Prevention of Blindness, Inc., of New York City, brings out some thought-provoking facts. Have these findings any implications for the school shop? Are there school shops, too, where goggles are used but seldom, and should shop teachers take an interest in conserving sight?

Getting the Students to Help

A recent news release by the Westinghouse Electric and Manufacturing Company discloses that in the space of six months the employees at one of their plants had given over thirteen hundred suggestions for speeding up production, saving man-hours, or conserving the use of critical materials. Five hundred forty-four of these suggestions were adjudged so valuable that awards totaling over forty-six hundred dollars were given to the workers who submitted the worth-while hints.

This large manufacturing firm has found it pays to listen to the suggestions coming from their toolmakers, die setters, inspectors, mechanics, and clerks. While the firm's large engineering departments and huge laboratories, manned by highly educated technical experts, develop formulas and direct production, the men on the production line who also are endowed with brains and common sense, quite frequently see opportunities to shorten certain operations, and their suggestions may be very much worth while.

In the school shop similar untapped sources of potential brain power and practical understanding may be found. As a matter of fact the student may frequently see the need of the moment more readily than does the teacher who is beset with numerous problems of various kinds.

It is well, then, to tap this source of inspiration. It is quite possible that the number of really worth-while suggestions will be quite small in the course of a year, but even one good idea gained from the student body will amply repay the effort required to get it.

Put up a suggestion box. Get your students interested. Work out a set of awards and see what will come of it.

As an example of what some student has done in connection with this idea, see the gremlin poster for the drafting room shown on page 293 of the September issue. Mr. R. R. Bedker who submitted the poster stated that the entire idea had been conceived and executed by one of his students.

Guidance is an organized undertaking based on reliable information, sympathetic counseling, and approved techniques, which seeks to enable pupils through their own efforts, interests, abilities, and urges, to make progressively better adjustments within themselves and to their environment with maximum personal satisfaction and optional social efficiency.

— J. Edward Maymen

Problems and Projects

BEGINNERS' WOOD-TURNING PROJECTS

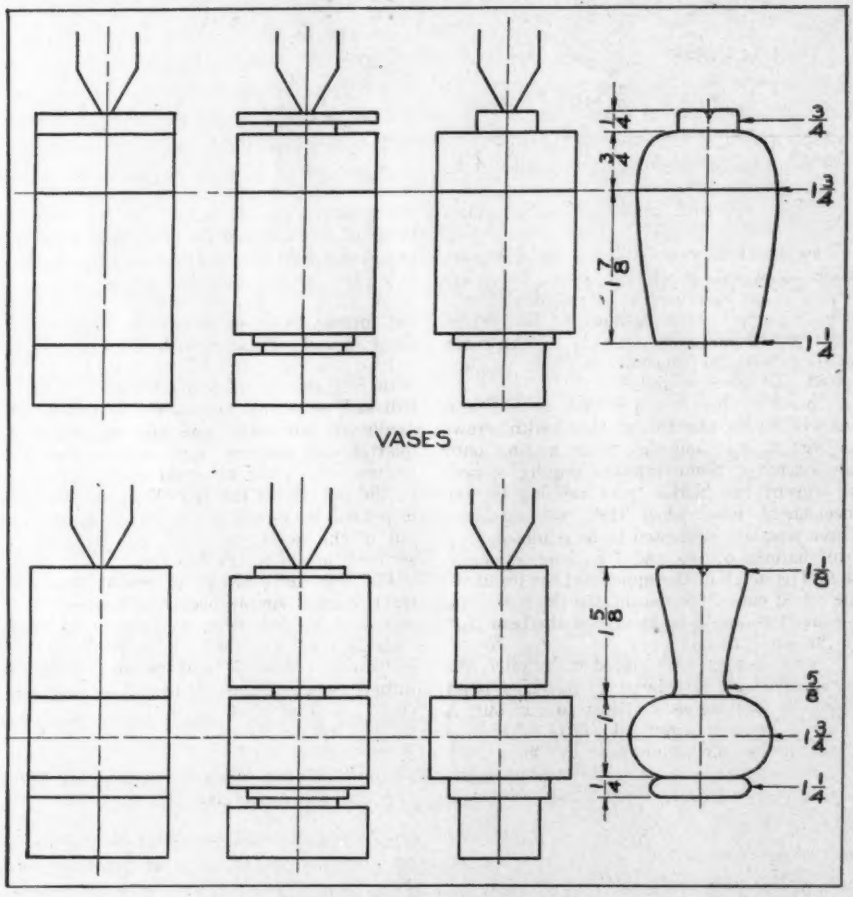
ARTHUR O. GARDNER
Bay View High School
Milwaukee, Wis.

As youngsters, many of our present high school instructors were given a course in wood turning which consisted of a long series of exercises on 1¾ by 10-in. cylinders. Not only did they have to turn out these exercises, monotonous as they were, but they had to use cutting tools instead of the scraping tools. Wood turning, if taught, should be practical — a means to an end. The pupil should make something the first time he uses a lathe. The use of skew chisels should be entirely eliminated. Only gouges, parting tool, diamond point, round nose, and square nose chisels should be used. Special scraping tools may be made out of old files, if necessary. In addition, a series of step drawings should be made up of the initial projects. Each step should be demonstrated, and each pupil checked, step by step, on the first few jobs.

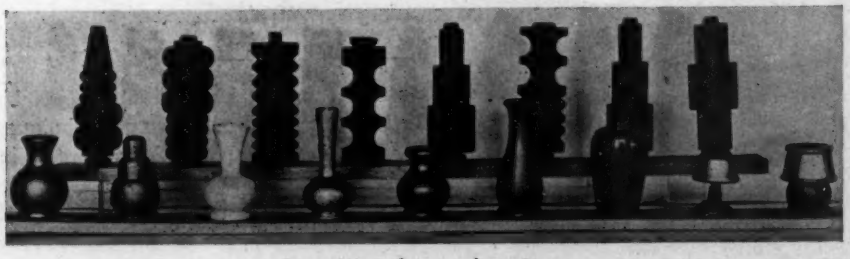
The miniature wooden vases, two of which are illustrated with step drawings, may be used instead of so-called exercises. After it is turned and cut off, each vase must be finished before it leaves the shop. Two methods of finishing may be used: (*a*) one coat of flat white followed by two coats of pastel shades of enamel, or (*b*) one thin coat of shellac followed by two coats of bronze paint in any of the colors — silver, gold, bronze, copper, etc.

After the four vases are completed, each pupil should be asked to design and make a different vase or miniature. Some very good miniatures have been made in this way. Emphasis should be placed on the following points.

1. Correct marking of lines on the cylinder.
2. Use the parting tool on the correct side of the line.
3. Have the bases of the projects perfectly flat or slightly concave.
4. Drill the holes to hold the artificial flowers in the exact center. The drilling should be done on a drill press.



Turning exercises into projects



A variety of turned projects

PROTECTING THE HANDS

WARREN A. JOCHEM
Teachers College
Trenton, N. J.

When working in oils and grease in the machine shop, or in the auto-mechanics shop, cleaning the hands necessitates a good deal of scrubbing and time wasting.

To obviate this, try the following hand-protecting paste:

Formula

1. A bar of Castile soap (broken up). Ivory chips are excellent.
2. Add enough water to dissolve soap completely.
3. Heat and evaporate water until soap has the consistency of thick soup.
4. Cool and whip with egg beater for about three minutes.

This whipped up soap is rubbed on the hands until it completely disappears. It forms a protective coating, which, after working in grease, washes off with the grease when the hands are washed in water.

Those who work around with grease and oils will find this very helpful.

LAWN-MOWER GRINDING RIG

LOUIS M. ROEHL
Department of Agricultural Engineering
Cornell University
Ithaca, N. Y.

Lawn mowers can be easily sharpened by the use of a homemade sharpening rig that is driven by a ¼ h.p. motor as herein illustrated. A capacitor motor needs to be used due to the fact that the mower may start hard, thus requiring full capacity of the motor. Equip a 1725 r.p.m. motor with a 2-in. V pulley. A ½ by 52-in. V belt runs from the motor pulley to a 12-in. V pulley on the countershaft. A 3-in. V pulley on the other end of the countershaft runs a similar belt to the mower wheel. See Figure 1. The speed reduction thus runs the cylinder of the mower at

Fig. 1. Power tram of lawn mower grinding rig

about the same speed as in use, which is a good speed for grinding.

The grinding is accomplished by changing the wheel ratchets so that the machine is run backward. Emery dust and cylinder oil are placed on the shear plate of the machine to do the grinding. The cylinder, of course, is turned down to the shear plate to cause grinding to occur.

The frame consists of a 2 by 10 by 60-in. plank which is widened at one end for a distance of 24 in. to 13⅝ in. to support the mower. See Figure 2. A guide board ¾ by 3½ by 24 in. is nailed at each side for the movable base *A*. Since mower wheels vary in size the movable base *A* is necessary to draw the machine tight into the belt.

A piece of round iron or shafting ⅝ by 17 in. is used for the countershaft. Hardwood blocks 2 by 6 by 8 in. are used for the shaft bearings. Oil holes are drilled in the blocks at top. The blocks are attached to the edges of the plank with 5/16 by 3-in. lag screws.

The adjusting is accomplished by the mechanism shown at *B*. A piece of ⅜ by 1 by 9-in. iron is bent to a right angle as indicated, and a 9/16-in. hole is drilled for the ½-in. crankshaft. Two screw holes are drilled and countersunk so the iron may be set in flush on the underside of the plank as shown at *C*. Another piece of iron ⅜ by 1 by 3 in. is bent as shown at *B*. In it a 27/64-in. hole is drilled and tapped with the ½-in. tap for the threaded end of the crank. Holes are drilled for screws by which it is attached to the movable platform as shown at *E*. A piece of round iron ½ by 14 in. is bent as at *B* and 7 inches of the straight end threaded. By use of cotter pins and washers the crank is held at a fixed place and thus the platform drawn to tighten the belt.

Two blocks 2 by 4 by 6 in. are made. A 5/16 by 2½-in. machine bolt is placed in each block with the head set into the wood from the under side to prevent turning. The blocks are fastened with screws as shown at *C*.

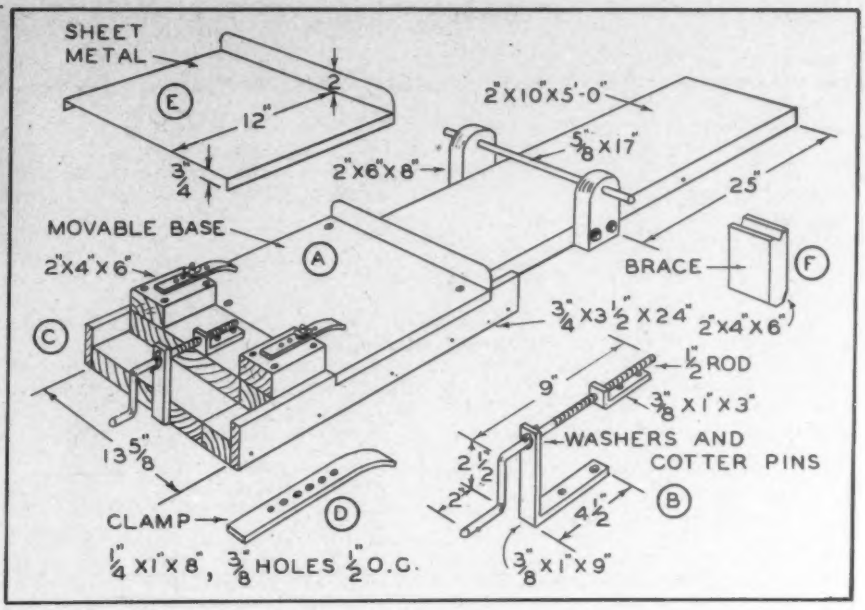


Fig. 2. Details of lawn mower grinding rig

Two metal clamps ¼ by 1 by 8 in. are made as shown at *D*. Six ⅜-in. holes are drilled ½ in. on center as indicated. One end of each clamp is bent as shown to fit over the roller of the mower or rear end of the shear plate to hold the machine in place as illustrated in Figures 1 and 3.

A piece of sheet metal is bent as at *E* and fastened on the movable platform with screws to prevent grit and dirt from getting onto the assembly. Some mowers require a post to prevent the blades from rubbing on the sheet-metal base when they are attached. Three sizes are suggested to be made of 2 by 4-in. material 6, 6½, and 7 in. long, as shown at *F*. The notch at the upper end fits up under the round bar of the mower and the lower end is shaped as shown to fit against the bent part of the sheet metal.

Emery dust may be placed in an oiler, the spout of which may be cut back to a point where its size allows the dust to run out. A thin, flat stick or a putty knife is suitable to push the dust and oil down on the shear plate where the grinding is to be done.

In fitting lawn mowers it is good practice to turn them upside down and also sharpen the front edge of the shear plate with a mill file.

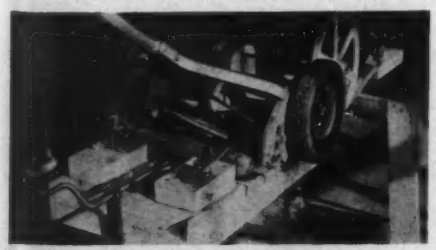


Fig. 3. Assembly of power lawn mower grinding rig showing the clamping and adjusting device

KEENE CEMENT TILES

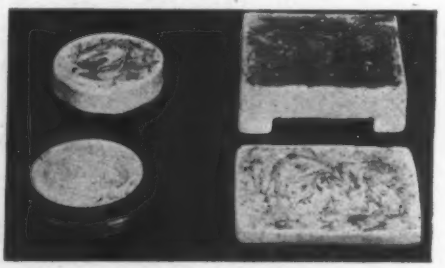
JEROME LEAVITT
Roslyn Heights, N. Y.

Tile making with Keene cement is ideally adapted to the elementary school, and would be a worth-while addition to a program of ceramics, concrete construction, or industrial arts.

Both boys and girls, as young as those in the first and second grades, can make simple tea tiles. These tiles require about one and one half to two pounds of Keene cement which costs approximately five to seven cents per pound. Each youngster can be asked to bring in a round, square, or oblong cardboard box from 3 to 5 in. across for the mold, a large tin can to mix the cement in, and a small stick to stir the cement. The process for mixing the cement is the same for all projects and will be described later.

In grades four and five, a very lovely tile with feet can be made by taking a piece of half-inch wood, the size of the bottom of the cardboard box mold, and cutting out three-quarter inch squares from each of the four corners. The piece of wood is then fastened to the bottom of the box. When the cement is poured in, it will flow into the spaces cut out of the wood and form feet that will be securely joined to the flat top.

For the lathe work, in grades seven or eight, a good simple beginning problem is to turn a 5-in. disk from a piece of half-inch mahogany or other suitable wood. After this is turned, a suitable and pleasing design is turned on the edges. A three and one half circle one fourth of an inch deep is turned in the center. The bottom of this circle is made larger than the top in order to keep the cement from falling out after it has dried. When all of the turning has been completed, the wooden piece is finished with whatever type of finish is desired. Then the cement is poured in and allowed to set for about two days. The tile is then put back on the lathe



Tiles made with Keene cement

and finished in the same way as the other tiles.

Individual tiles for setting in a tile top table can be made in loose fitting wooden forms of the desired size. If the forms are lightly greased, the tiles can be easily removed and the frames used again. When enough tiles of the desired size are made and properly finished, they are ready to be set in a tile top table.

All tiles can be made the same way. Pour some water in a can and mix in thoroughly with the correct amount of cement for the size of the job to be done. The cement should be of the consistency of ordinary builder's cement, or a little thinner than cake batter. (More water might have to be added if the mixture is too thick.) It is then poured in the form that has been previously prepared for it. If a solid color is desired, dry powdered paint is mixed with the cement before it is poured. If a mottled or design effect is desired, one or more colors are sprinkled across the top of the tile immediately after the pouring and a stick is then pushed up and down or lightly stirred back and forth over the surface. This process forms a very interesting design. Care must be taken to see that very little powder is left loose on the surface, as this will make a pitted tile. By experimenting with the cement and powdered paints very novel effects can be attained.

When the tiles have set for about two days, they are removed from the cardboard or wooden frames and washed in cold water. After the tiles have dried, they are filed to shape with woodworking files. Next, they are sanded flat with No. 2 sandpaper and then sanded out with No. 0 to remove all scratches. (It is helpful to wrap the sandpaper around a block of wood or lay a sheet of sandpaper on a bench or table, and rub the tile over the sandpaper. The pouring and sanding process is quite messy so it is best to protect the table or workbench with a layer of newspaper before work is started.)

After the tiles have been sanded perfectly even and smooth, they are waxed and polished or given a thin coat of white shellac. Finally a piece of felt is glued to the bottom of the tile in order to protect the surface upon which it is to be placed.

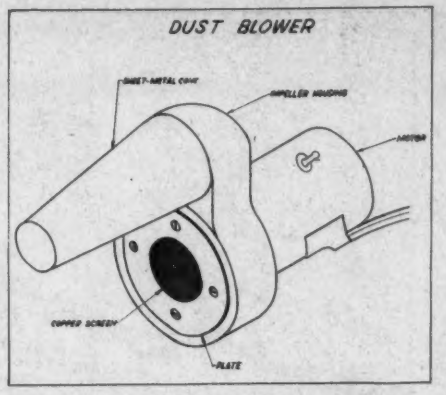
A HANDY BLOWER

C. H. THOMPSON

High School
Latrobe, Pa.

Most woodworking shops have need for a blower of some kind to remove dust from machines and "hard-to-get-at-places." The one illustrated has been particularly useful in our woodworking shop.

Dust blower



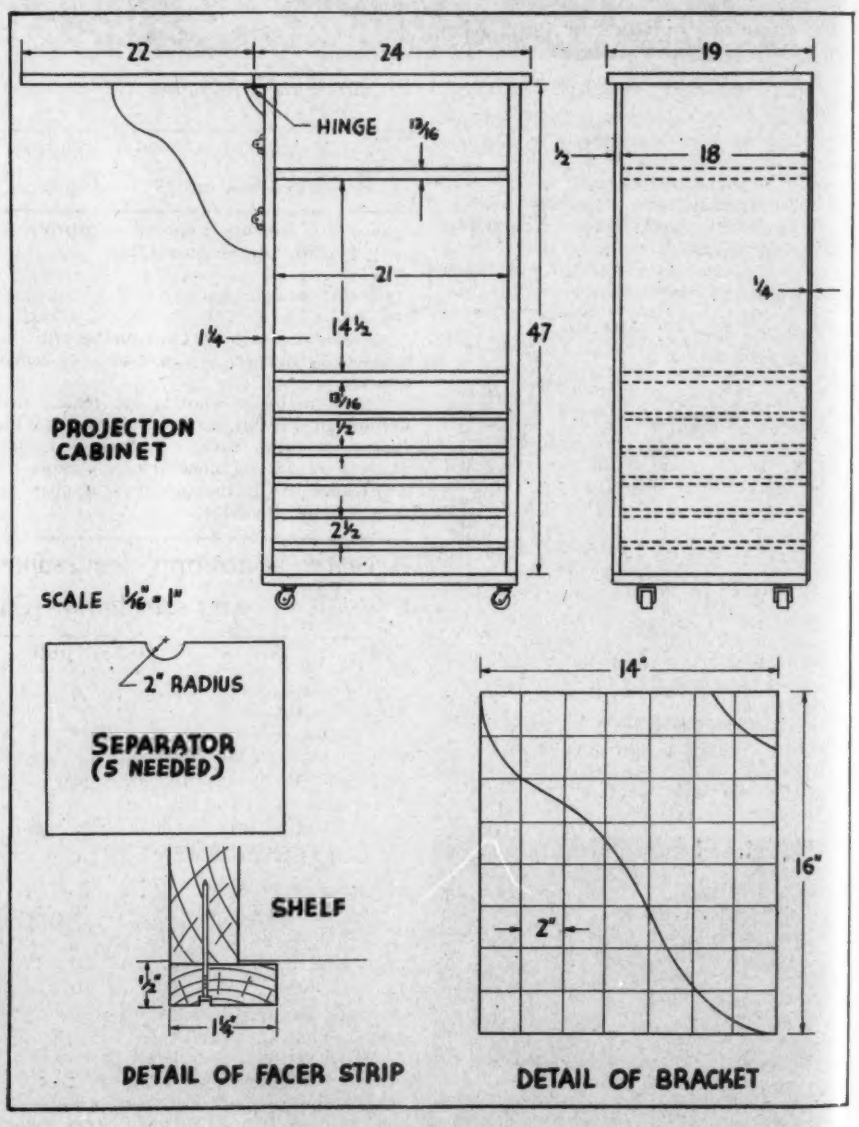
It is made from the suction arrangement of an old Hamilton-Beach sweeper. The impeller housing was reversed and faced on a lathe. In the sheet-metal shop we made a galvanized iron cone and soldered it over the former bag connections. A plate with a copper screen covering the hole is attached to the front of the housing. When plugged in, a blast of air is forced through the cone sufficient to remove all heavy dust.

PROJECTION CABINET

GERALD BAYSINGER

Detroit, Mich.

The projection cabinet illustrated and described herewith, provides space for storing slide-film kits. The slide-film projector can be placed on top of the cabinet, which is a suitable height for projection in the classroom. A folding top may be added to provide space for a 16mm. motion-picture projector. The bracket should be mounted on hinges so that it can be swung back to allow the folding top to drop down. The cabinet is mounted on casters to permit easy movement about the room. If desired, a door can be added so that



Projection cabinet details

The projection cabinet in the classroom

the projector and slide-film kits may be locked.

The cabinet may be made of redwood, which is available in the necessary widths, or plywood. Standard cabinet construction should be followed in assembling the parts. Finish the cabinet to harmonize with either the furniture or the woodwork in the room.

BILL OF MATERIAL

No. of Pieces	*Name*	*Size*
1	Top	13/16 by 19 by 24
1	Bottom	13/16 by 18 by 23½
1	Folding top	13/16 by 19 by 22
2	End	13/16 by 18 by 47
2	Shelf	13/16 by 18 by 21½
1	Bracket	13/16 by 14 by 16
5	Separator	½ by 18 by 21½
1	Back	¼ by 22 by 48
2	Facer strip	½ by 1¼ by 47
1 Pair 2½ butt hinges		
1 Pair butterfly hinges		
4 casters		

NEW TYPE FACES HELP PRINTING DESIGN

HARTLEY E. JACKSON
San Jose State College
San Jose, Calif.

Look into the type cases of many school printing offices and you will find a preponderance of outmoded and unsatisfactory type faces. Yet good design in printing — so highly desired by all printing teachers — depends in large measure upon the types used.

Century Expanded is not an attractive type face. It is not used in modern printing, even as a newspaper body type. In this field, it has been superseded by more readable designs. Nevertheless every equipment list provided for purchasers of school printing plants specifies Century Expanded and Century Bold as the principal type items.

Compare this face with one of the pleasant traditional Oldstyles:

Have types few but fit!—*Updike.*
Have types few but fit!—*Updike.*

Fig. 1. Century Expanded (above) and Garamond Oldstyle

Century has no place in the school shop, and replacing it with the many attractive types seen in today's printed matter will tremendously improve the appearance of school printing.

There are many who do not realize that well-designed types, entirely apart from the context of print, have a charm and beauty of their own. Type alone also may express a wide range of abstract qualities, or may induce various emotions.

A Letter is not only *doing something*; it is *being something.--Gill*

Fig. 2. Lydian and Lydian Italic

In the hands of the typographic designer, a well-selected type becomes not only a means of conveying to the reader a sense of pleasure, but also a medium for imparting to him wordless impressions of such qualities as strength, dignity, integrity, quietness, and so on. Even single lines of some types, standing apart, are pleasing and expressive.

Type has a soul"Everett

To make print beautiful is worth effort.—F. W. GOUDY

Fig. 3. Goudy Text (above) and a Cursive letter

Some teachers feel that the purchase of new types involves great expense. This is not so. Twenty-five to fifty dollars will be sufficient to purchase enough type fonts to impart a fresh and attractive appearance to a large part of the printed matter turned out in the average school shop.

Resettings, like the ones shown below, gain favorable comments from school boards and school administrators as well as from the

OFFICE OF SCHOOL BOARD
MAY COUNTY HIGH SCHOOL
MAY COUNTY, ARIZONA

Office of SCHOOL BOARD
MAY COUNTY HIGH SCHOOL
MAY COUNTY, ARIZONA

Fig. 4. Century and Garamond Oldstyle

public. More than this, by making better design possible to the student, new types help him to turn out work in which he has great pride of accomplishment.

Dr. Benjamin M. Franklin

Dr. Benjamin M. Franklin

Fig. 5. Shaw Text (above), and Engravers Text

As the late H. H. Taylor wrote, "No student has any chance of learning the fundamentals of design in printing, unless he be supplied with a type face of good design with which to work."

Replacing the antiquated letters in school type cases with a selection of new types is quite necessary, if printing in schools is to attain to its best and highest achievement, that is, the teaching of good design.

MAY COUNTY HIGH SCHOOL
Students Absent or Tardy

MAY COUNTY HIGH SCHOOL
Students Absent or Tardy

Fig. 6. Century Bold (above), and Lydian

CHARGING SLED

G. HAROLD BILLINGHAM
Woodrow Wilson High School
Weehawken, N. J.

Most football coaches like to have some sort of *charging sled* available for use in helping to condition the squad, and the making of this apparatus is nearly always allotted to the industrial-arts department.

The charging sled that we constructed was designed with special emphasis on low cost, strength, between-season storage, and the specifications of the coach.

Materials required were nine pieces of 4 by 8 in. by 16-ft. fir (chosen for its low cost), 52 lag screws ½ by 7 in., and 52 flat washers to fit the lag screws.

Four of the timbers were left the full length, three were sawed into pieces 7 ft. long, and two were sawed into 4-ft. lengths, being cut as shown in the illustration.

The pieces were fastened together entirely with lag screws so that the sled can be readily taken apart, entirely if necessary, to save storage space. During games, with the addition of three planks and V blocks, the apparatus can be used for seats.

A shop class of 16 boys built this job in less than two hours, right on the playground. Constructing it there saved a great deal of time and energy since our field is nearly a half mile from school.

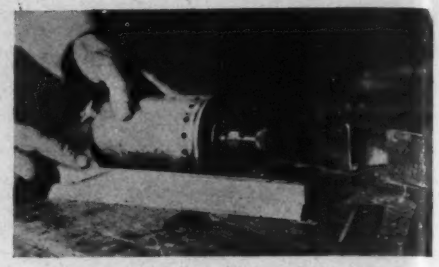
Padding can be tacked to the seven *bucking* posts and covered with burlap or canvas for a very effective job. Usually there are some discarded football pants around the school. The legs of these can be stuffed and tacked to the posts, or the padding can be sewed in, and a strap attached to the top and bottom so that the entire pad can be removed easily after each practice. This will save a great deal of wear and tear, and aid in keeping the pads dry.

The finished job can be coated with linseed oil, painted, or left as is.

GRINDING JOINTER KNIVES

D. C. MARSHALL
High School
Manhattan, Kans.

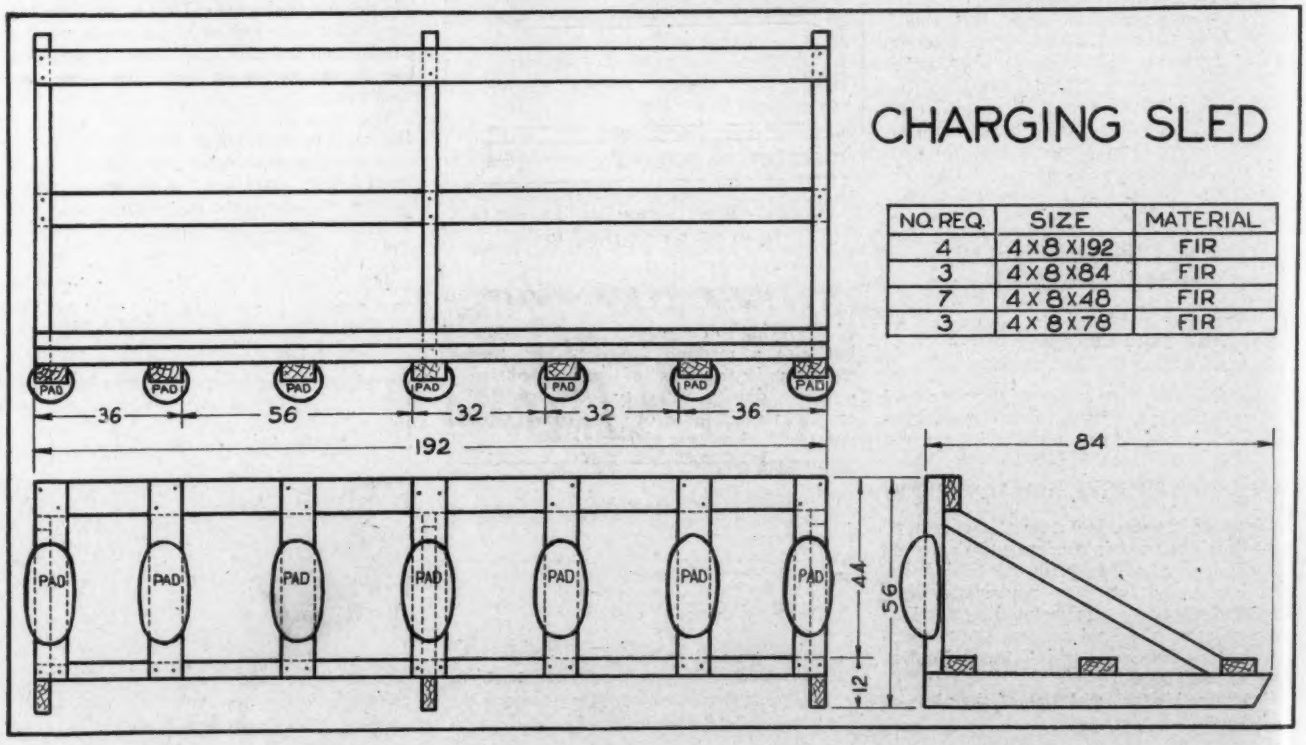
Keeping a jointer in good working order is a difficult job when new knives are not to be had and plants equipped for grinding them are busy doing war work. Necessity being the mother of invention, we have worked out a method of doing a grinding job by using our router-shaper motor and the small grinding wheels which are made for it.



The only equipment needed to sharpen jointer knives is a router-shaper and a grooved block to hold the knife while grinding

To hold the knife in one position while it is being ground, a hardwood strip is first machined smooth and straight. Then a groove, making a snug fit on the knife, is plowed into this piece. The shaper fence is next set as a guide for this carrier, and the shaper motor is adjusted to the proper angle for the type of

The knife is set into the grooved block carrier and is pushed between the shaper fence and a grinding wheel



stone being used. By taking very light cuts and running each knife through two or more times before resetting the fence, it is a simple matter to remove the same amount from each knife so that they will balance when on the machine. If the knives are nicked badly as sometimes happens in a school shop, the cut can be heavier until the nicks are out. A coarse wheel for the first grinding and a fine one for the finishing will reduce the amount of honing necessary.

When the knives have been ground, a little honing on a straight oilstone block removes any burr and produces a keen edge. Where this type of router shaper is not available, a motor to which small grinding wheels may be attached can be used by improvising a table on which to do the work.

NEW TOOLS FROM OLD

N. H. POOLE

Emmerich Manual Training School
Indianapolis, Ind.

No doubt by this time many metal-shop teachers have used up all of their tool steel stock, and are wondering where replacements can be found. It is the purpose of this article to suggest a source of supply and to present a few tools that have been made from this source.

As the title suggests, this is a salvage project which consists of making new tools out of broken and worn-out tools. Many shop teachers have been reworking old tools, but have never thought of this in the light of a class project where the student can gain skill and experience in forging, and learn about heat-treating many kinds of tool steels.

While this list is not complete, here are a few broken and worn-out tools which can be reworked into various other kinds:

The tops of all kinds of auger and woodworking bits; countersink bits; broken screw drivers; old round and flat files; wood lathe tools; engine lathe tools; old wood chisels and gouges; old plane irons; old power hacksaw blades; old wrecking bars; broken wrenches; jointer and planer knives; broken star drills; and molder's tools.

These broken tools may be found in the school shop or shops, in the boiler room or maintenance department, in local hardware stores, junk yards, and repair shops.

This section will describe the reworking of all old tools since the general procedure is the same regardless of the kind of tool that is being forged. Since the analysis of these scrap tool steels will vary as also will the previous heating temperatures, it is not practical to give exact heats at which all can be worked. However, a little experimenting should be done with the metal before actual work is started on the project. Schools that have a pyrometer will have little trouble in keeping correct heats once the best forging, hardening, and tempering heats are known. If a pyrometer is not available it is suggested that a clean piece of cold roll steel be heated along with the trial tool steel so that the various oxides caused by heating can be observed and the scraps of cold roll saved for comparison when working the tool steel. (The color of the heat oxides on cold roll and tool steel are similar.)

Fig. 1

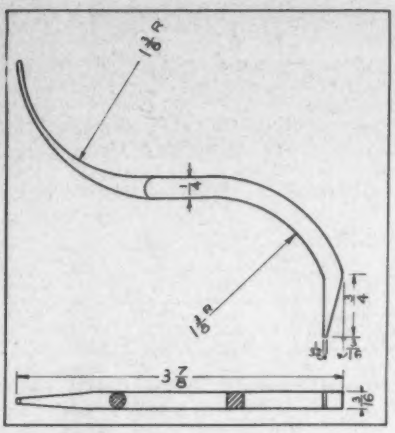


Fig. 2. Cotter key puller made from an old round-point turning chisel

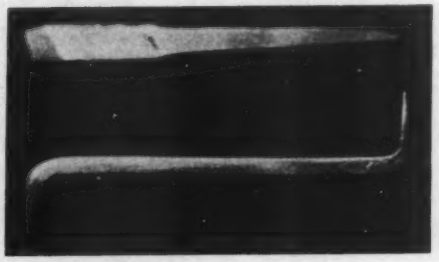


Fig. 3

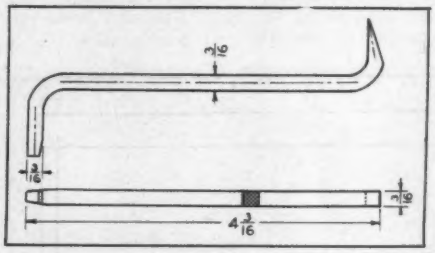


Fig. 4. Offset screw driver made from an old parting tool

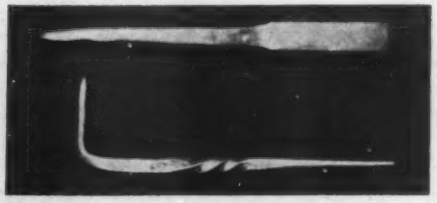


Fig. 5

Figures 1 and 2 show a cotter-key puller made from an old round-point turning tool. Select the tool and anneal it. Forge the flat end to size and shape. Draw the other end to a point. Grind out tool marks and rough polish. Heat the puller in a muffle to the hardening heat and quench in oil. Draw temper to a deep straw, about 500 deg. F. At this temper a sharp file will mark the tool. Buff and polish the puller.

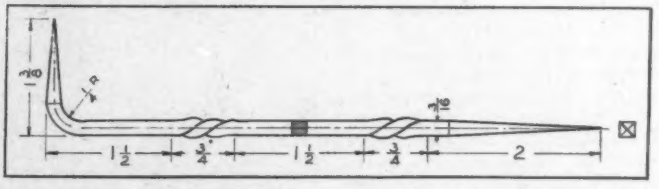


Fig. 6. Scriber made from an old diamond point chisel

First, anneal the tool steel. This is done by heating the steel to about 1400 or 1600 deg. F., or a full cherry red. Allow the steel to cool slowly in the warm still air in the heat-treating furnace, or bury it in warm dry ashes. Many kinds of tool steel forge well at a medium cherry red which is around 1300 deg. F. At the end of each class period be sure to normalize the metal. Normalizing is done to relieve strains caused from forging and to produce a finer, more uniform, grain structure.

A few things to remember when working with tool steels are: heat slowly and uniformly, but do not overheat. Never allow steel to soak in the fire. Never chill or immerse in water during the forging processes as this may cause cracks. Harden on a rising temperature. Break round rods down by forging them square, then octagonal, and back to round, thus preventing the end from bursting. Never try to bend or twist steel when it is below the forging heat as this may cause the metal to crack or break into pieces.

When grinding and polishing your work be sure to wear goggles and canvas gloves, preferably of the wristlet type. Tuck necktie into the front of the shirt and keep sleeves buttoned or rolled up. Take short grinds and cool the tool often in water so as not to overheat and destroy the temper. Do not hold work at the grinder with rags or waste. Keep work on grinder tool rest and hold it with a firm grip. Use a canvas buffer and rouge for final polishing.

The six tools which have been chosen to illustrate the possibilities for tool salvage and shop training are all old wood lathe turning chisels. The purpose in using wood turning tools is to suggest the possibilities and variations that can be made from one kind of old tools. These tools are small and if care is not exercised the metal will be burned during the heating operations.

Figures 3 and 4 show an offset screw driver made from an old parting tool. Forge the annealed steel to size and shape, and bend one end, then shape and bend the other end in the opposite direction. Use the same procedure for hardening and tempering as was used for the cotter-key puller. Buff and polish.

Figures 5, 6, 7, and 8 show scribers made from an old diamond point and a square point turning tool. This illustrates how variation can be made in a simple tool. First forge the metal to 3/16 in. square. Next forge and bend the one end and then forge the other end. Rough polish. Now lay off for each twist by making dots with the center punch. Reheat, and while at the forging heat, clamp one end of the tool in the vise at lower mark, and clamp a monkey wrench at the top mark and give a half turn, keeping the work in line during the twisting. If two twists are used, repeat the layout, heating and clamping for the other twist. Figure 7 uses one full turn for the twist and round instead of square ends. Harden and draw temper to a blue-red or about 570 deg. F. The scriber can just be filed at this temper. Buff and polish it.

Fig. 7.

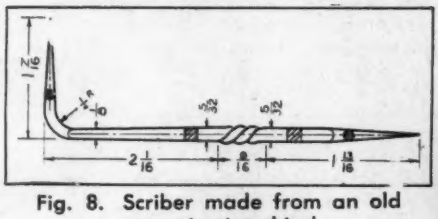


Fig. 8. Scriber made from an old square point chisel

Figures 9 and 10 show a center punch made from a small turning gouge. First anneal and then forge the gouge round using the 3/8-in. top and bottom swages to make a uniform round. Harden and draw temper to a straw yellow or about 460 deg. F. Grind point, buff, and polish.

Figures 11 and 12 show a trowel made from an old skew chisel. This is the most difficult tool of this group to forge and great care must be taken during the final heats or the thin blade will be burned or pitted. After annealing the metal the handle is forged. Measure in about 3 in. on the tang end of the skew and at this point make several center-punch marks across the metal. Now heat the metal at the marks and form the shoulders for the handle by placing one edge over a sharp corner of the anvil and striking a square-edge set hammer, which is held over the opposite edge of the skew, a few blows with the sledge. Cut away excess material with the hot chisel. Forge the handle round and finish it between a pair of 3/8-in. swages which have been ground on the face so that the opening is slightly undersize. Lay off and bend the post to the correct height. Next

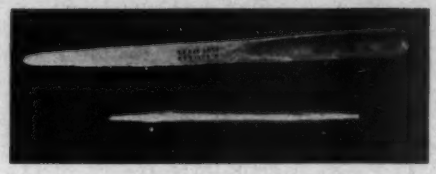


Fig. 9

Fig. 10. Center punch made from an old gouge

forge the blade to a thickness of 3/32 in. This can best be done by using a two-pound hand hammer, striking heavy blows and working fast to avoid extra heats. Hammer on the top side of the blade only. Use a flatter to smooth out all tool marks and to bring the blade to the correct thickness. Use a tin pattern to lay off the shape of the blade and trim away excess material. Shape the post at the blade with a set hammer. Rough grind and polish the trowel. Place the tool in a muffle and heat to the hardening temperature. Quench in oil by immersing the point, first moving the blade around in the oil. Draw the temper by placing two hot iron bars on either side of the blade, and move the tool frequently in order to insure uniform heating. When a brown oxide is visible on the blade, plunge the whole trowel into warm oil. Buff and polish the blade and post, then put on the wood handle.

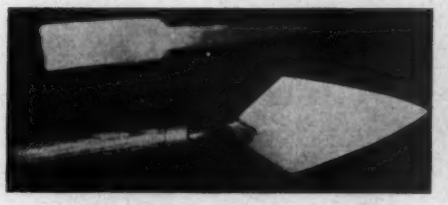


Fig. 11

FIRE PREVENTION

The Safety Research Institute, 420 Lexington Ave., New York City, recommends the following:

1. Recharge extinguishers immediately after use and after the interval of time recommended by the manufacturer.
2. Use only recharging supplies and replacement parts obtained from the manufacturer.
3. Follow the instructions on the units closely when recharging all types of extinguishers.
4. Inspect extinguishers at least once a month to make certain they are filled, operative, and have not been tampered with.
5. If an extinguisher is damaged by a blow or fall so that there is a possibility that the shell or seam has been damaged, have the extinguisher tested by the manufacturer or his agent.
6. Do not attempt repairs of damaged extinguishers. Return them to the manufacturer for the skilled work such service demands.
7. Designate someone as inspector, and see that he is familiar with the inspection and recharging of extinguishers, and thoroughly understands the correct methods for keeping the equipment ready for instant, efficient use.

THREE SPOOL HOLDERS

ARTHUR O. GARDNER

Bay View High School
Milwaukee, Wis.

Depending upon the needs of the person for whom the spool holder is intended, the three sizes and types of spool holders were designed.

Spool holder with pin cushion

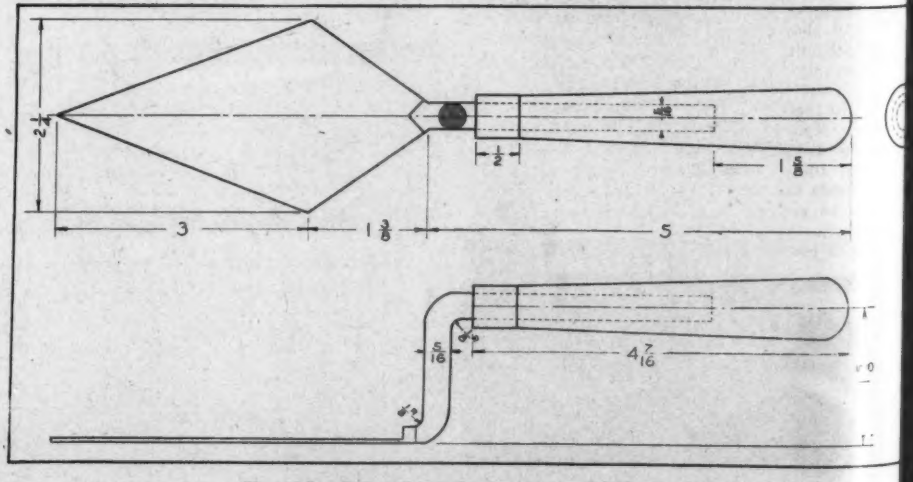
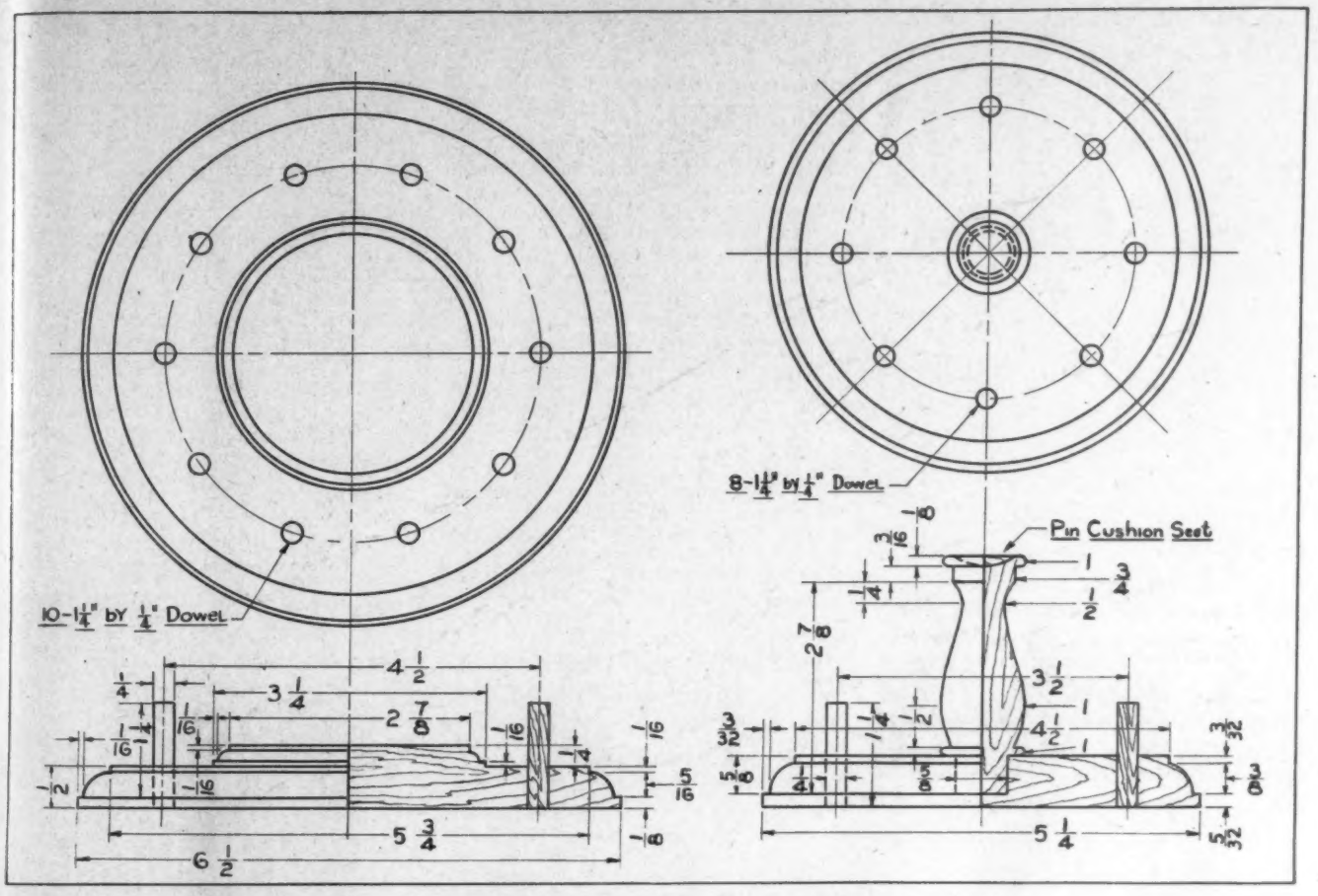
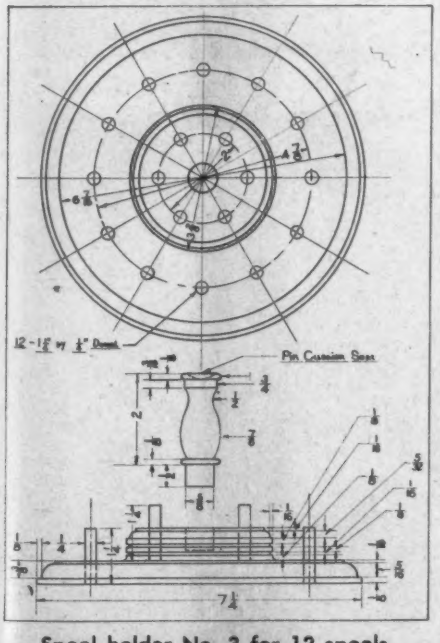


Fig. 12. Trowel made from an old skew chisel



Spool holders No. 1 and 2 for 8 and 10 spools



Spool holder No. 3 for 12 spools

Spool holder number one without the upright has a large tomato pincushion instead, and holds ten standard size spools. It can be placed in a drawer. Number two holds eight spools whereas number three has room for twelve standard spools and six spools of the type containing thread for stocking repairs.

The bases of gum, walnut, or any other wood are attached directly to the face plate and turned to the dimensions given in the illustrations. Before they are finished it is necessary to put on the center line for the pegs. Divide the circle into the required number of parts and center punch carefully. Then sand, stain, and polish in the lathe. Remove base and drill holes in a drill press. Stain and insert pegs. Use a drop of glue on each peg. A felt base may then be glued on, or blotting paper may be substituted for the felt. Spread a thin coat of glue on the base. Press the base onto the paper and file the blotting paper at the edge. Use three rubber covered nails, equally spaced, as feet.

The pin cushions can be obtained at most ten cent stores. The large tomato type for number one is nailed on with a large headed nail. Be sure to lift up the leaf on top of the tomato before nailing. The head must not show. The strawberry type pin cushions are glued to the uprights.

"A reckless boy or girl can go to hell in half an hour, and so maybe our earnest young people can start moving in the right direction — with even so little as one day a week in school." — *Dr. R. L. Cooley*

WIRE VS. WIRELESS CODE

C. H. NIEMANN
Hammond, Ind.

Since communication is one of the chief requirements for the carrying on of the war, on the land, in the air, and on the sea, it is necessary to train large numbers of both men and women in this work. Centers for this training are established in various parts of the country and, therefore, a large number of instructors are required to teach the theory of radio, plus sending and receiving by code.

From all indications it has been somewhat of a problem to find competent instructors in either theory or code and a still greater problem to find instructors that can teach both. Therefore, a partial solution of this condition would be to induce any available Morse code operator to switch over to the wireless code. It is this difference in the two codes and the difficulties involved in changing over from the Morse (wire code) to the Continental (wireless code), that prompted the writing of this article.

Having learned the Morse code so thoroughly that it seems impossible to forget it and then being given a class in the Continental, wireless, code, it became necessary to devise a means of learning the letters, numerals, and abbreviations that are different from those in the Morse code. The following is an explanation of how this was accomplished.

Morse code	*Continental Code*
C. . .	C. — . — .
F . — .	F . . — .
J — . — .	J . — — —
L — —	L . — . .
O . .	O — — —
P	P . — — .
Q . . — .	Q — — . —
R . . —	R . — .
X — . . —	X — . . —
Y	Y — . — —
Z	Z — — . .
1 . — — .	1 . — — — —
2 . . — . .	2 . . — — —
3 . . . — .	3 . . . — —
4 . . . . —	4 . . . . —
5 — — — —	5 . . . . .
6	6 — . . . .
7 — — . .	7 — — . . .
8 —	8 — — — . .
9 — . . —	9 — — — — .
0 — —	0 — — — — —
Period . . — — . .	Period . — . — . —
Comma . — . —	Comma — — . — —
Question — . . — .	Question . . — — . .

A suggested way of associating the Continental code letters is shown below, with results obtained shown in parentheses.

C — . —. which is the same as double N of the Morse code (no difficulty).

F . . —. is same as Q in Morse code. Associated as FQ (no difficulty).

J . — — — this is equal to A. M. in Morse code and should be associated with JA M. (no difficulty).

L . — . . being the same as X in Morse code, can be associated as LX (no difficulty).

O — — — is same as number 5 in Morse code. No association was necessary, due to the fact that the letter "O" in Morse code is dot space dot, and thus so much different from the Continental "O," that (no difficulty was encountered).

P . — — . this is number 1 in the Morse code and should be associated as "P-1" (no difficulty).

Q — — . — is equal to "MA" in Morse code and the association with this word is sufficient (no difficulty).

R . — . being the same as F in the Morse code, the association "RF" was (not difficult).

X — . . — is the same as number 9 in the Morse code; the association of "X9" should be remembered (with slight difficulty).

Y — . — — no definite association can be formed with this letter, but in view of the fact that the letter "Y" in Morse code, is so entirely different, it was possible to learn this letter (with slight difficulty).

Z — — . . being the same as number 7 in the Morse code and being the last letter in the alphabet the association of "Z-7" was (not difficult).

(1) . — — — — one dot indicates the number (dots and dashes total 5).

(2) . . — — — two dots indicate the number (dots and dashes total 5).

(3) . . . — — three dots indicate the number (dots and dashes total 5).

(4) . . . . — four dots indicate the number (dots and dashes total 5).

(5) . . . . . five dots indicate the number (dots total 5).

(6) — . . . . one dash indicates the number (dash and dots total 5).

(7) — — . . . 2 dashes indicate the number (dashes and dots total 5).

(8) — — — . . 3 dashes indicate the number (dashes and dots total 5).

(9) — — — — . 4 dashes indicate the number (dashes and dots total 5).

(10) — — — — — 5 dashes indicate the number (dashes total 5).

It will be noted that although all the numerals are different from those in the Morse code, an association can easily be formed, by merely remembering that in the numbers from 1 to 5 you count the dots. Then in the numbers from 6 to 10 you have the dashes first and dots, to total 5, except in number 10, where you have 5 dashes. These numbers are more easy to learn than those in the Morse code, because of this uniformity of dots and dashes.

Period . — . — . — Since this is the same as triple "A" in the Morse code, there is (no difficulty) involved in learning this punctuation mark.

Comma — — . — — A possible association is with "MW" in the Morse code. However, since the comma is so much different from the other letters, numerals, and punctuation marks, it is not difficult to identify it.

Question . . — — . . Same as period in Morse code (no difficulty).

PREPARING AND FINISHING ALABASTER

GULLY S. WALTERS

Woodward Junior College
Woodward, Okla.

The large pieces of alabaster which are brought into the shop are first sawed into the sizes required for the desired project. It is not advisable to use a good handsaw for this purpose, but have selected one of my older ripsaws for doing the rough cutting. One boy brought in an old rusty cross-cut saw with the handles rotted out. We replaced the handles, sharpened the saw, and it has proved to be satisfactory for cutting the rock into usable sizes.

One side of the rock must then be made perfectly level so that a board can be glued to it, which in turn is fastened with screws to the faceplate of the lathe. This leveling can be done satisfactorily with an old plane or wood file. Old files sharpened similarly to lathe tools make excellent chisels for cutting the rock into different projects on the lathe.

There are several ways to finish these projects. One is to sand them with 6/0 or 7/0 speed-wet garnet paper and then polish them with floor wax. Hot linseed oil also may be used to bring out the colors, after which a French polish may be applied. The most satisfactory way to obtain a high polish is first to apply linseed oil to bring out the colors, and then with a soft cloth or buffer apply "aluminum and metal wax."

DUNCAN PHYFE TABLE

JOHN W. STRUCK

State College, Pa.

The Duncan Phyfe drop-leaf table illustrated herewith is a practical, up-to-date project for college or advanced trade students.

Duncan Phyfe Table

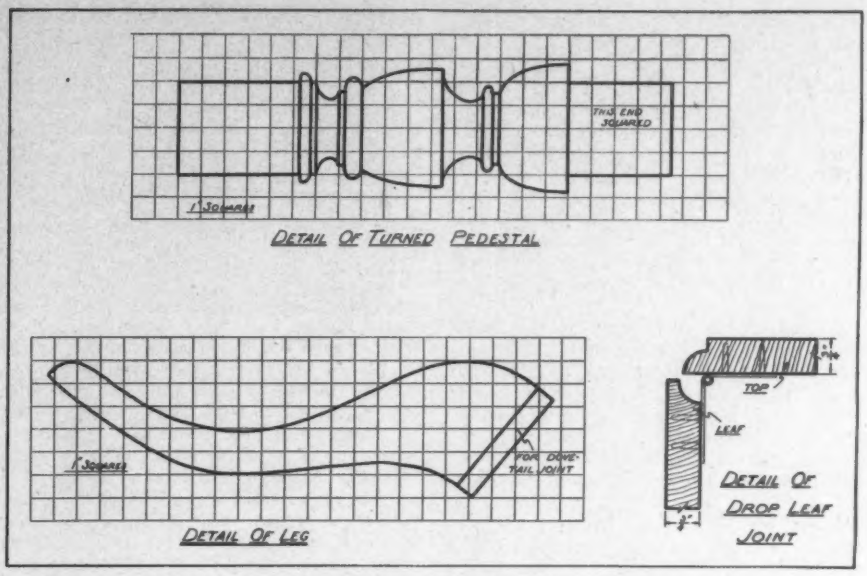
Projects made from alabaster

It may be made of any good cabinet wood such as walnut or mahogany. If mahogany is used, use top grade striped African mahogany and not the softer varieties of the wood. In selecting the pieces for the top and leaves, select boards which have an attractively figured, and yet fairly straight grain. If boards are used which have a very curving grain to them, it is difficult to match the boards, and the joints would be conspicuous. Try to select boards which will match well so that when the table is completed it will be difficult to detect separate boards which make up the large top and leaves. It is important to use only kiln-dried wood, because wood which is not kiln dried is quite likely to warp, causing the glue joints to spring apart.

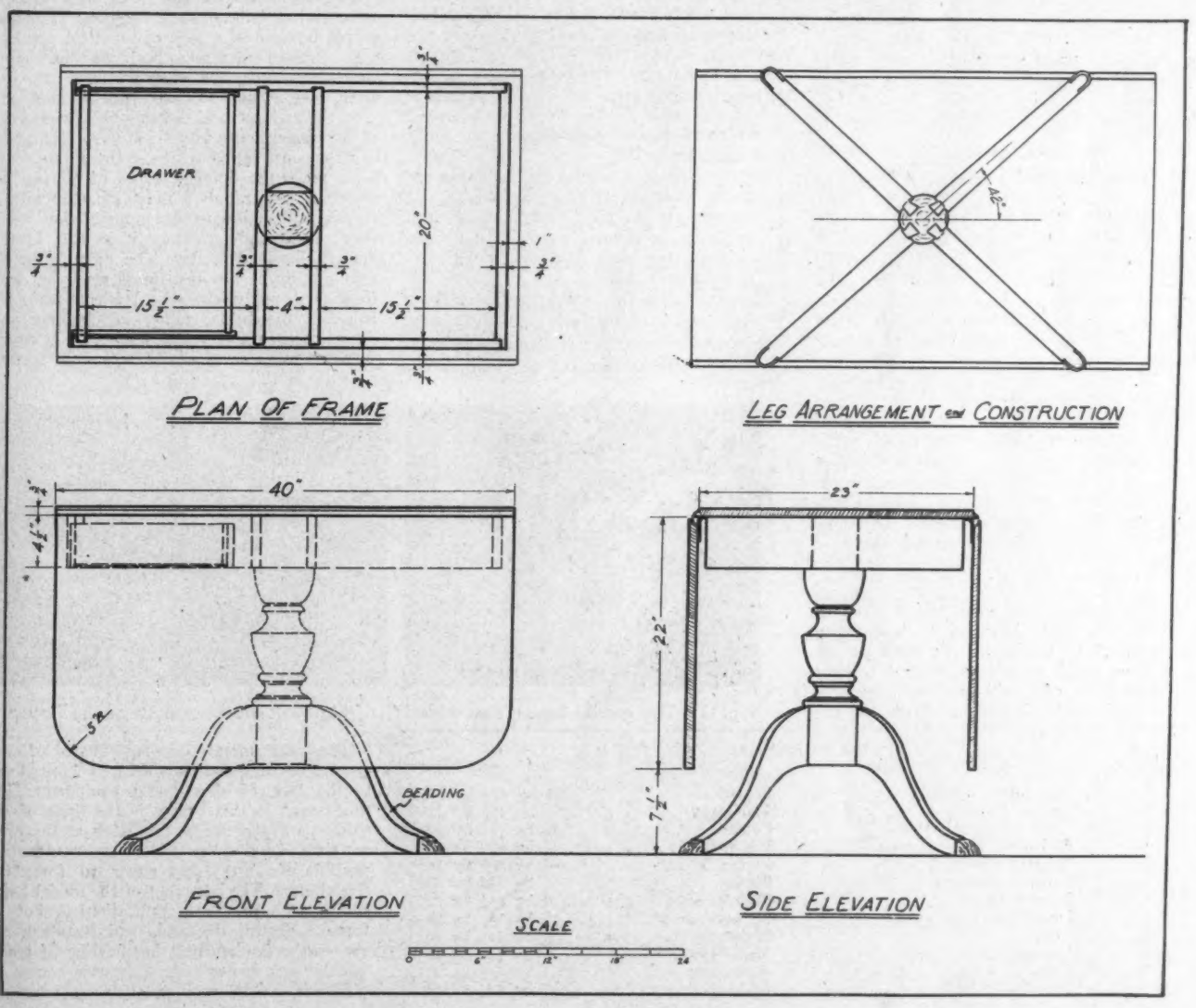
Many tables which are sold commercially have veneered tops, and this table could be made that way too. But a good deal of special equipment is needed to veneer large surfaces satisfactorily, and if the proper equipment is not available, it is best not to attempt a veneering job.

Construction

Because this table is quite large when it is opened out, 40 in. by 67 in., the dovetail



Details of pedestal and leg



joints which fasten the legs into the pedestal must be carefully and accurately made. This cannot be stressed too greatly. In making the joints for the boards of the top and leaves, joint the boards on the power jointer and then dress them up with a hand jointer plane. A hint on this is to make the joints *very slightly* hollow in the middle, lengthwise of the boards, thus making sure that the ends won't spring apart. A good quality animal glue should be used, but remember that if it is used too thick it is hard to draw the boards together tightly enough to prevent the glue from showing.

To reduce the cost, parts of the frame which will not show much, such as the side rails and the crosspieces, may be made out of a cheaper wood such as gum or poplar which can be stained so as to serve the purpose quite satisfactorily. The end rails, the pedestal, and the legs should be made of the same material as the top and leaves. In fastening the frame to the top, steel table-top fasteners are perhaps the best for the purpose. If these are not used, some other device such as homemade wooden fasteners should be employed which will allow for the expansion and contraction of the top. Under no circumstances should the top be fastened down to the frame so that it cannot expand. Nothing can keep wood from expanding under adverse climatic conditions, and many tables have been ruined by splitting because no allowance was made for the top to expand.

Accessories

The most satisfactory method of supporting the drop leaves is to use standard drop-leaf supports such as are shown in the half tone. These can be bought from hardware dealers. The larger 12-in. size is preferable because of the size of the leaves. Two leaf supports should be used for each leaf, placing them about 10 in. from each edge. Six drop-leaf hinges should be used, three to a leaf, placing the outer ones about 3 in. from the edge. This helps keep the leaf from warping, and gives it good support.

Cast brass claw feet are better than those of pressed brass. The ones shown on the table pictured were cast in the College foundry. They add a touch of distinctiveness not commonly found on tables having commercially made claw feet. Gliders should be put on so that the brass feet will not scratch the floor or rug.

Finish

A well-designed and constructed piece of furniture can easily be made to look cheap and ordinary by having a poor finish put on it. A *good* finish cannot be secured without the expenditure of much time and energy. It is the final finish which will either ruin the job or make it a beautiful work of art. From 20 to 30 hours of work is not too much for getting a first-class rubbed finish on this table.

Just before staining, do the final sanding with 6/0 sandpaper, making sure *all* marks and scratches are taken out. In staining, don't get the color too dark, as a relatively light shade is more cheerful and the grain will show better under normal home conditions. A pigment oil stain should be used because it is easy to apply and it gives a good even color. After the stain has dried at least 12 hours, fill the table *twice* with silex paste filler, leaving 36 to 48 hours between the first and second fillings. Paste filler should be about as thick as paint when it is applied, and it should be rubbed crosswise rather than lengthwise because rubbing with the grain tears the filler out of the pores to a great extent. Filling the table twice may seem like unnecessary work, but it is necessary in order to make sure that a finished surface of A-1 quality can be produced. For a final finish, either varnish or lacquer may be used. Whichever is used, apply three or four coats, rubbing down each coat carefully with either 6/0 sandpaper or fine 3/0 steel wool. After the final coat, rub it down with either pumice stone or Speed-wet No. 400, garnet finishing paper. The advantages of the waterproof paper are that it cuts quickly, reduces dust, and doesn't scratch. The surface can be polished to suit individual taste. After the desired finish is secured, the table may be waxed with a good quality paste wax to help protect the finish from scratches.

For the help of teachers, the following approximate time estimates are included:

Construction: Including everything up until ready for finishing.....61 hrs.
Finishing: Including staining, filling, lacquering, and rubbing.....26 hrs.

The above are the hours used in making the table shown, but other craftsmen may work at a slightly different rate of speed. It is important that quality be stressed rather than speed.

Fig. 1. The model house assembled

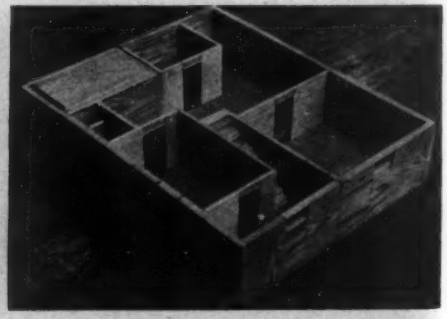


Fig. 2. The basement of the house

BILL OF MATERIAL

No. of Pieces	*Name*	*Material*	*Size*
2	Side rails of frame	Poplar	¾ by 4½ by 37½
1	End of frame	Mahogany	¾ by 4½ by 22½
2	Cross braces of frame	Poplar	¾ by 4½ by 20¾
1	End brace above drawer	Poplar	¾ by 4½ by 20¾
2	Sides of drawer	Poplar	¾ by 3½ by 14
1	Back of drawer	Poplar	½ by 3½ by 20¾
1	Drawer front	Mahogany	¾ by 4½ by 22½
1	Drawer bottom	Fir plywood	¼ by 14 by 19½
1	Top	Mahogany	¾ by 24 by 40
2	Leaves	Mahogany	¾ by 22 by 40
3	Legs	Mahogany	2 by 6¼ by 24
1	Pedestal	Mahogany	5¾ by 5¾ by 24

MODEL HOUSE FOR THE GENERAL DRAWING CLASS

RICHARD A. BROLLIER

High School
Jasper, Ind.

The model house shown in Figure 1 was constructed and designed in the Jasper High School, Jasper, Ind.

The house is built to the scale of 1 in. equals 1 ft., and is in eight sections, two sections making one complete floor of the house. It includes Venetian blinds, paneled doors which open and close, dormer windows, and a lighting system in the first and second floors.

This model house was built to be used as a practical instructional aid in our general drawing course. The recognized major objective of a general drawing course is "to develop in each pupil a knowledge and understanding of drawing, and the interpretation of the conventions used in drawings and working diagrams, and the ability to express his ideas by means of a drawing." In a general course of drawing where several areas are being taught, the architectural area was always more or less uninteresting for most students, simply because of a lack of practical application. Printed materials such as elevations, floor plans, stairways, cross sections, etc., too often have a *canned* effect upon the students.

In the architectural drawing class each floor of the model house may be studied separately and then in relation to the entire house. Students grasp the different types of house construction, illustrated in the textbooks, with a clearer understanding and appreciation when they can actually see how it is used in the modern house of today. The drawing plates now no longer are just *busy work* or *copy work*, but really give the students valuable help for the future either in planning and designing their own future homes, or in giving them an interest in drawing or construction as a life work.

The sheet-metal drawing phase of our general drawing course is severely limited due to the lack of sheet-metal equipment. The time spent in this course is the limit of the student's experience in this work at the present time. To give the student every advantage possible we are using paper to form our stretch-outs. The basement of the model house serves as a practical application. A hot air furnace drawn, designed, and installed, advances the fundamental justification of teaching this area in our general drawing course.

Words can be very practical up to a cer-

Fig. 3. The first floor

Fig. 4. The second floor

tain point. After that point is reached the instructor must present and demonstrate an actual object relating to the subject of discussion to make the lesson of value to the student. The main objective of our industrial-arts program is emphasizing and demonstrating our subject material in a practical, usable, method. The model presented herewith helps to do this.

BACK-YARD POULTRY HOUSES

LOUIS M. ROEHL
Department of Agricultural Engineering
Cornell University
Ithaca, N. Y.

For people who desire to keep a few hens in their back yard, plans of two back-yard poultry houses are herewith submitted.

Shed-Roof House

The shed-roof house, Figure 1, is designed so as to be entirely serviced from the outside. The garage lean-to house, Figure 6, allows the use of one side wall built full length or part length of the garage, depending on the number of birds one desires to keep. In planning the structures the sizes were made for hens and not for man, thus keeping space and cost to a minimum.

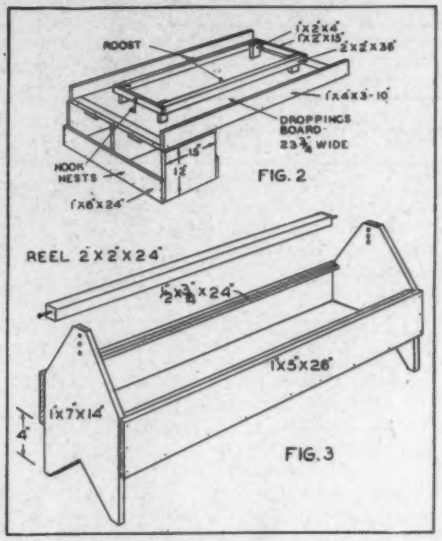


Fig. 2. Droppings board, roost and nest for shed-roof or garage lean-to back-yard poultry house.
Fig. 3. Poultry feeder

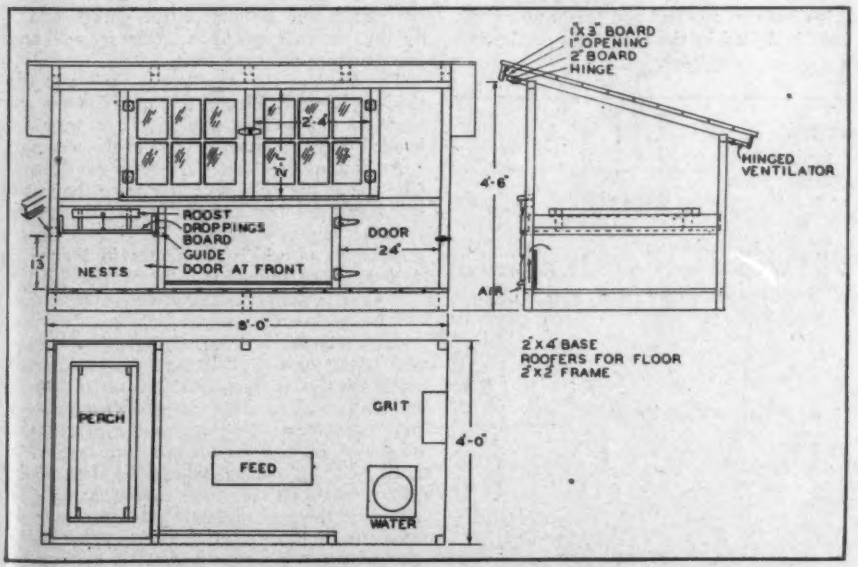


Fig. 1. Shed-roof back-yard poultry house

The floor plan of the shed-roof house, Figure 1, is 4 by 8 ft., and is about right for nine leghorns or seven larger birds. The frame of the floor is made of 2 by 4-in. material and common roofers. All other parts of the frame are made of 2 by 2-in. material. Roofers are suggested for the roof which may be covered with shingles or other roofing material.

Two common 6-light windows are placed at front. They are hinged and thus make openings for servicing the house. Loose pin butts are used and the windows removed in the summertime and screens used. At the bottom, right and left, doors are placed. The one at the right is for servicing the watering stand and shell and grit box. The one at the left is for servicing the nest, droppings board, and roost. At the left, two pieces of 2 by 2-in. material are framed across the house from front to back. On each a ½ by ¾-in. wood strip is nailed as shown in the detail sketch, Figure 1, thus making guides on which the droppings board slides. By this arrangement the droppings may be raked out at front with a hoe or the board drawn completely out and dumped. Dimensions for the droppings board, roost, and nests are shown in Figure 2. Each is independent of the other, thus facilitating servicing. The roost may need to be secured to the droppings board with a hook as suggested in the drawing. The nests are slid under the droppings board and are easy of access immediately in front of the door.

It should be noted in the cross-section drawing that provision for ventilation is made at the eaves. An air intake is arranged by leaving a 1-in. slot at the floor level between the two middle studs at front as shown in the front and cross-section drawings, Figure 1. A board nailed above the slot at a slant serves as a drip cap to keep rain out, and a baffle

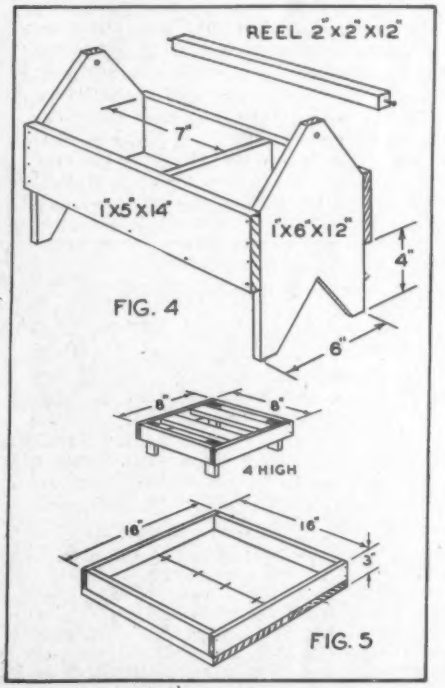


Fig. 4. Shell and grit box. Fig. 5. Watering stand and drip box

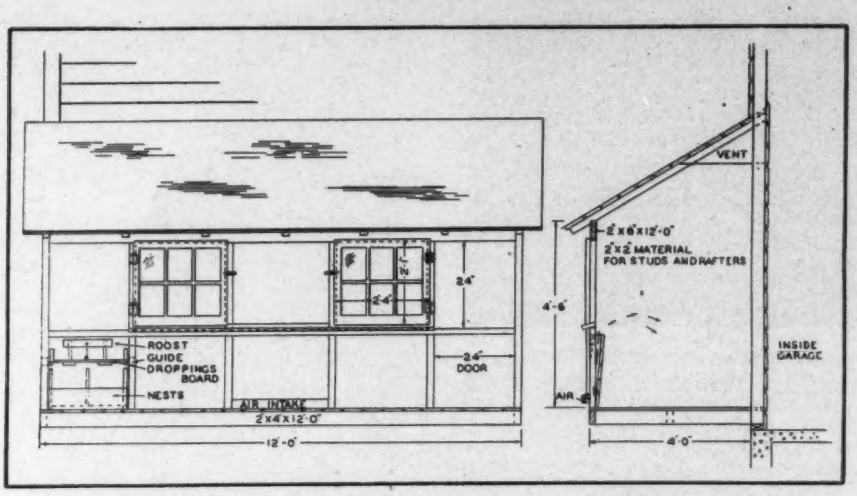


Fig. 6. Garage lean-to back-yard poultry house

board on the inside of the studs direct the air currents up and not directly on the birds.

On contemplating construction of either of the houses, one should go to the local lumber dealer and find the material best suited for a wall covering. The wallboards are desirable in that they are easy to cut to shape and size required, but the soft wallboards should not be used because the hens pick them. Whatever material is used, it should be painted outside as is done with any other structure that is exposed to the weather.

Drawings of the poultry feeder, shell and grit box and watering stand appear in Figures 3, 4, and 5. The feeder and grit box are made to stand up off the floor to facilitate cleaning. To prevent the birds from dripping water on the floor at the watering stand, and spreading it about the house with their wet feet, a shallow box is placed under the stand. This may be partly filled with sawdust, shavings, dried grass, straw, or the like, and drawn out and cleaned frequently. The watering stand and grit box are suited for either house. The feeder may need to be made longer for more than 12 hens. A reel is necessary to keep hens off the box. It is shown in Figure 3. A similar reel is used for the grit box. A 16d common nail is driven in one end and the head cut off. A hole is drilled in the other end of the reel and a loose spike used.

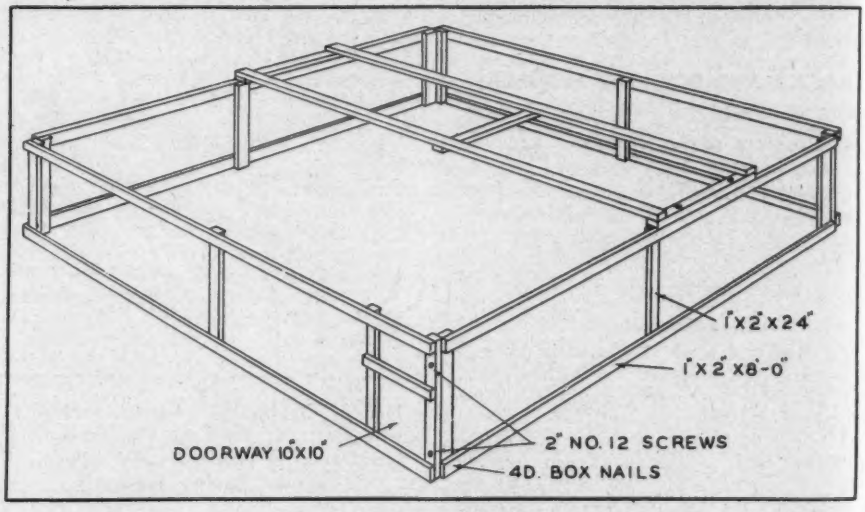


Fig. 7. Poultry yard

BILL OF MATERIAL

(For shed-roof back-yard poultry house.)

Capacity — 9 leghorns, 8 heavy birds

Pieces	*Size*	
1	2 by 4 in. by 8 ft.	Fir
1	2 by 4 in. by 12 ft.	Fir
3	1 by 6 in. by 10 ft.	Facias and ventilators
2	1 by 2 in. by 8 ft.	Nests, droppings board, roost, feeder, shell and grit box, watering stand, baffle board
1	1 by 4 in. by 8 ft.	
1	1 by 10 in. by 10 ft.	
2	1 by 6 in. by 10 ft.	
1	1 by 8 in. by 10 ft.	

38-ft. roofers
76 lineal feet 2 by 2 material
90 bd. ft. of surface lumber or hard wallboard for front, back, and ends
2 lb. 6d common nails
2 prs. 2½-in. loose pin butts
2 prs. 3-in. T hinges
45-ft. roll roofing
2 pr. 2-in. fast pin butts
2 — 6-light sash, 25 in. high, 28 in. wide
1 pt. paint
19 — 1 by 2 in. 8-ft. battens
64 ft. of 1½-in. mesh poultry netting
1 pr. 2-in. loose pin butts for one top panel

Garage Lean-to House

If the garage lean-to house, Figure 6, is to be built, it is suggested that the roof slope be the same as that of the garage and the same material used for roof and wall covering. This will add materially to the appearance. It is 4 ft. wide and may be built the full length of the garage, which is usually 16 ft., or of any desired length.

The floor consists of roofers that rest on 2 by 4-in. framing material. For the rest of the frame 2 by 2-in. material is used with the exception of the plate at front. Here a 2 by 6-in. piece is used so that the windows will clear the roof when they are opened.

The siding is removed from the garage studding and placed on the inside of the garage wall, thus increasing the size of the structure and providing for easy attachment of the frame to the building. A door that is at least 6 ft. high may then be placed between the garage studding and much of the service work done from the inside. If one chooses, the siding may be left on the garage and 2 by 4-in. material spiked to the garage wall and the structure attached to it.

The front of the structure is similar to the shed-roof house, Figure 1. Two windows are used for light and service. They may be hooked open and screens used in the summer.

At bottom, right and left doors are placed. The one at the right is for servicing the water stand and grit box and the one at the left is for the nests, droppings board and roost, dimensions of which are shown in Figure 2. A longer feed box needs to be provided if the structure is built the full length of a garage and more than 12 hens are kept.

An air intake is arranged by leaving a 1-in. slot at the floor level between the two middle studs at front as shown in the front and cross-section drawings. The simple scheme shown in Figure 1 may be used, or an intake built as shown in Figure 6. A piece of 2 by 2-in. stock is sawed diagonally and the long wedge pieces nailed to the studs on the inside. The studs are then boarded up, leaving an opening at the top for the air to enter, rise, and spread as indicated by the arrows. A permanent opening 7 in. high should be made in the gable on the windward end. A hinged door of

BILL OF MATERIAL

(For garage lean-to urban poultry house — 15 leghorns, 12 heavy birds.)

No. of Pieces	*Size*	
3	2 by 4 in. by 12 ft. — 24 ft.	
1	2 by 2 in. by 12 ft.	
7	2 by 2 in. by 12 ft.	
2	1 by 2 in. by 8 ft.	Nests, droppings board, roost, feeder, shell and grit box, water stand
1	1 by 4 in. by 8 ft.	
1	1 by 10 in. by 10 ft.	
2	1 by 6 in. by 10 ft.	
1	1 by 8 in. by 10 ft.	
152 bd. ft. roofers		
100 bd. ft. of siding or hard wallboard for ends and front and air intake		
3 lb. 6d common nails		
2 pr. 2½-in. loose pin butts		
2 pr. 3-in. strap hinges		
1 roll of roll roofing		
2 — 6-light sash, 25 in. high, 28 in. wide		
1 qt. paint		
19 — 1 by 2 in. by 8 ft. battens for yard		
64 ft. of 1½-in. mesh poultry netting		
2½ doz. No. 12 by 2-in. f.h. wood screws to assemble yard		
1 pr. of 2-in. loose pin butts for one top panel		

similar size should be built at the other end for summer ventilation.

Poultry Yard

In each of the houses a small door should be built at floor level at the place most convenient for an outside yard. For a yard or run make 8 panels and assemble with screens as shown in Figure 7. Size of run depends on space available and the number of hens. The one shown is 2 ft. high and 8 ft. square. Battens 1 by 2 in. by 8 ft. are used. The panels are covered with 1½-in. mesh, 2-ft. poultry netting before they are assembled for the run. The slats are nailed together with 6d box nails. The panels are assembled with two No. 12 by 2-in. f.h. wood screws at each end of each panel. Since screws may be difficult to remove, two other methods of assembling the panels are suggested. One is to use ¼ by 2½-in. lag screws with washers and the other to tie them with heavy cord. A door opening is framed in one panel for the birds as suggested in the drawing wherever the opening needs to be made to fit the exit door of the house. Removal of the screws allows the panels to be placed one above another and stored in the minimum of space.

One top panel may be hinged to another to facilitate servicing the yard.

MAKING PLASTER OF PARIS MASKS

ALBERT KOSLOFF

Instructor, Naval Air Technical Training Center; on leave from Waller High School, Chicago, Ill.

It is the purpose of this article to present a process and a project that has proved very interesting to boys and girls of high school age. Making plaster of Paris masks gives a pupil in an art, industrial-arts, or ceremics class a chance to work with a material whose use is growing in many fields. Apart from the pleasure that is derived from making these masks, the process teaches the pupil to work with a material that is easily obtained, teaches mixing of plaster, and offers a good subject for an assembly program.

Making plaster of Paris masks consists first of making a form called a *negative* by applying a plaster of Paris paste to a person's face, then pouring another mixture of plaster into the negative and making a mask or *positive* from the negative form. Making these types of masks is not difficult and does not involve any danger to the individual whose face is covered with plaster. Make sure that the person of whom the mask is being made has no cold or other difficulty that may interfere with his breathing. Upon first touching the face, the plaster feels comfortably cool. When the plaster starts to harden, it becomes warmer. If made carefully, the positive will be an exact reproduction of an individual's face.

The materials required for making a mask are easily obtained. The following materials are necessary to complete the process successfully: (*a*) a cardboard frame, (*b*) two breathing cones, (*c*) about four pounds of plaster of Paris, (*d*) a ½-gallon can, (*e*) vaseline or petroleum jelly, and (*f*) some clean rags.

Directions for Making Mask

1. First, make a cardboard frame, as shown in Figure 1, to hold plaster on face and to keep plaster from running down. Make cutout in cardboard so that it fits over head, exposing face, and rests a little in back of cheek bones.

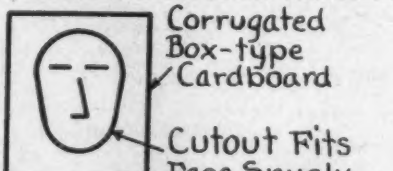


Fig1. CARDBOARD FRAME

2. Now, make breathing cones out of thin cardboard or strong paper, as shown in Figure 2. Cones are fitted into nostrils allowing individual to breathe normally when his face is covered with plaster. Cones must be rolled up so that they do not distort nostrils and must be inserted so that they do not irritate nostrils and hamper breathing.

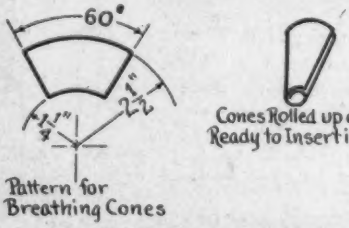


Fig2. BREATHING CONES

3. Prepare person of whom mask is to be made by rubbing a uniform, thin coat of vaseline or petroleum jelly over his face. The vaseline coat prevents plaster from tending to stick to face. Rub enough vaseline over eyebrows, eyelashes, and hair near forehead so that the plaster will not cling to them.

4. Next, mix the plaster in a ½-gallon can. Use 1 part of water to 3 or 3½ parts of a good grade of plaster of Paris by volume. About two pounds of plaster will be sufficient for making the negative. It is advisable to mix a little of the plaster to find out how quickly it will harden and how thick it should be before mixing plaster for application to face. Plaster should harden in about ten minutes.

5. Have person of whom mask is being made and whose face has vaseline on it lie down on a table, face up, with his head slightly raised to make him more comfortable. Put the cardboard frame over his head, face exposed. Carefully insert breathing cones in his notrils. See that individual's eyes are closed and relaxed so that they do not become tired when plaster is covering them.

When individual is relaxed, apply plaster to his face with your hands. Be careful not to get any plaster into cones, as this may interfere with person's breathing. Plaster should cover whole face and should be at least ½ in. thick. Once the plaster starts to harden, the face must be motionless. Even a smile will crack the plaster.

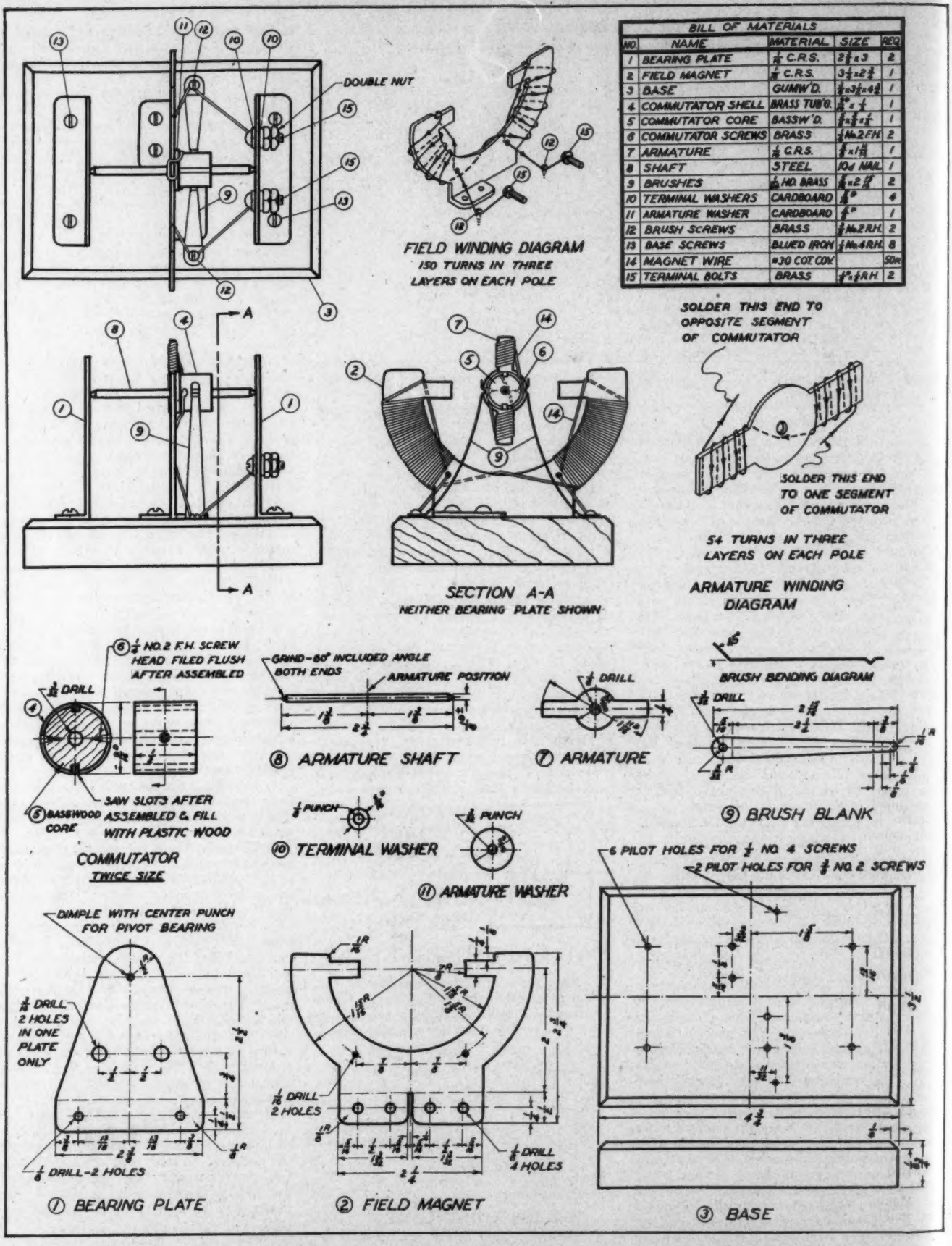
It is necessary to have an assistant hold the hand of individual whose mask is being made so that subject may squeeze the assistant's hand to let him know that everything is all right. Should the person whose face is covered with plaster have any difficulty breathing, remove plaster covering his mouth, thus letting him breathe through the mouth. Then when the rest of the plaster hardens, it can easily be removed from face.

6. As soon as the plaster is hard, it is carefully removed by pushing it slightly in the direction of the person's feet and then pulling mask up.

7. To make the positive or actual mask, rub vaseline well into every part on the inside of the negative. Mix another batch of plaster and pour it into the negative. This mixture may be thinner than that for making negative. In order to be able to hang completed mask, put a wire hook into plaster before it hardens. When the plaster is absolutely hard and the negative is carefully broken off by giving it a few blows with a hammer, the mask, a perfect reproduction of the face, will be left.

8. Give the mask one or two coats of shellac all over to protect it from moisture, atmosphere, etc. The mask may then be given a final coat of enamel or paint or it may be finished to imitate the original face.

If many masks are desired of the same face, then it is wise first to make a positive of lead that has been melted and poured into the negative. As many plaster of Paris negatives as are necessary may then be made from the lead positive. Finally, plaster of Paris masks may be made from the plaster negatives.


DOUBLE NUT
FIELD WINDING DIAGRAM
150 TURNS IN THREE LAYERS ON EACH POLE
SECTION A-A
NEITHER BEARING PLATE SHOWN
SOLDER THIS END TO OPPOSITE SEGMENT OF COMMUTATOR
SOLDER THIS END TO ONE SEGMENT OF COMMUTATOR
54 TURNS IN THREE LAYERS ON EACH POLE
ARMATURE WINDING DIAGRAM
BRUSH BENDING DIAGRAM
⑨ BRUSH BLANK
⑧ ARMATURE SHAFT
⑦ ARMATURE
COMMUTATOR
TWICE SIZE
SAW SLOTS AFTER ASSEMBLED & FILL WITH PLASTIC WOOD
BASSWOOD CORE
GRIND-60° INCLUDED ANGLE BOTH ENDS
ARMATURE POSITION
⑩ TERMINAL WASHER
⑪ ARMATURE WASHER
DIMPLE WITH CENTER PUNCH FOR PIVOT BEARING
2 HOLES IN ONE PLATE ONLY
6 PILOT HOLES FOR ¼ NO. 4 SCREWS
2 PILOT HOLES FOR ⅜ NO. 2 SCREWS
① BEARING PLATE
② FIELD MAGNET
③ BASE

BILL OF MATERIALS				
NO.	NAME	MATERIAL	SIZE	REQ
1	BEARING PLATE	⅛ C.R.S.	2½ x 3	2
2	FIELD MAGNET	⅛ C.R.S.	3½ x 2¾	1
3	BASE	GUM W'D.	⅞ x 3½ x 4¾	1
4	COMMUTATOR SHELL	BRASS TUB'G.	⅜" x ¼	1
5	COMMUTATOR CORE	BASS W'D.	⅜ x ⅜ x ¼	1
6	COMMUTATOR SCREWS	BRASS	¼ No. 2 F.H.	2
7	ARMATURE	⅛ C.R.S.	⅜ x 1⅝	1
8	SHAFT	STEEL	10d NAIL	1
9	BRUSHES	1/32 HD. BRASS	⅜ x 2 25/32	2
10	TERMINAL WASHERS	CARDBOARD	⅜"	4
11	ARMATURE WASHER	CARDBOARD	⅜"	1
12	BRUSH SCREWS	BRASS	¼ No. 2 R.H.	2
13	BASE SCREWS	BLUED IRON	½ No. 4 R.H.	8
14	MAGNET WIRE	#30 COT. COV.		50 YDS
15	TERMINAL BOLTS	BRASS	4-40 x ¼ R.H.	2

Assembly and details of model electric motor designed by W. E. Slaby, Detroit, Mich.

WHAT DECORATIVE METHODS ARE USED ON WOOD?

Inlays of vari-colored woods are used in contrasts with backgrounds in the form of line or elaborate decoration.

Carved Butter Mold *Landis Valley Museum*

Painted figures are applied directly to wood surfaces as decoration and protection.

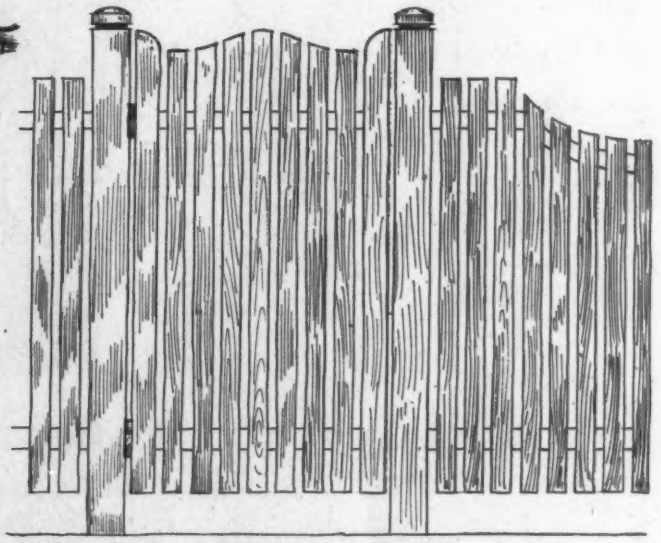
Inlaid Chair Panel 16-17th Century Marx and Taylor, Measured Drawings of English Furniture

The natural colors of wood are altered or intensified by the use of bleaches and stains. Surface textures are further developed with oil, wax and varnish as may be appropriate.

Painted Chest Panel, 1787 Pennsylvania Museum of Art

Splat from Chippendale Chair

Piercing and Sawing



Picket Fence and Gate

Balanced and Orderly Arrangement of Parts

Plate 24. Design course by Burl N. Osburn, director of industrial arts, State Teachers College, Millersville, Pa.

NEED THE DESIGNER KNOW PERIOD STYLES?

What are "period styles"? A relatively unified and consistent treatment of construction, materials, form, and decoration, maintained for sufficient time to become established. Styles have their origins in social traditions and customs, in political movements, in commercial stimulation, and in the ideas of a dominant designer.

Styles have evolved

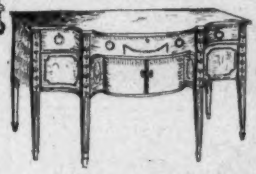
from

the use of simple native materials, close and sympathetic relation to architecture, the craftsman's ideals of enduring construction, retention of significant decoration and form, little regard for comfort, fitting the organic growth of the family as an enduring institution, the expression of a people's philosophy of living, regional or national acceptance, and slow change,

Italian Seat 15th century

Elizabethan Draw-Table 16th c.

William and Mary Highboy 17th century



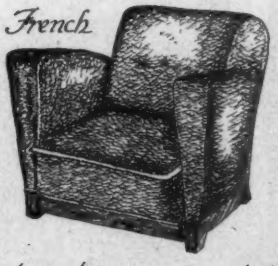
Hepplewhite Sideboard 18th cent.

toward

a world source of material, random relation to architecture, commercial standards of construction, search for new forms, decoration without significance, goals of luxury and comfort, prepared for temporary use, of relation to the philosophy of the day only as it indicates a lack of convictions, international acceptance, "smartness" and sophistication, and rapid change.

Louis XV Side Chair 18th cent.

American 1850



French 1925

American Contemporary

How are these styles used today? The modern designer accepts traditional styles largely because he is unable to devise anything else the public will accept. Furniture designing is divided, in the main, between rather inept modifications of the traditional forms, and a few sincere attempts to produce purely functional articles without regard for history. If the period styles are to be followed, they should, at least, be correct.

Plate 25. Continuation of design course by Burl N. Osburn, director of industrial arts, State Teachers College, Millersville, Pa.

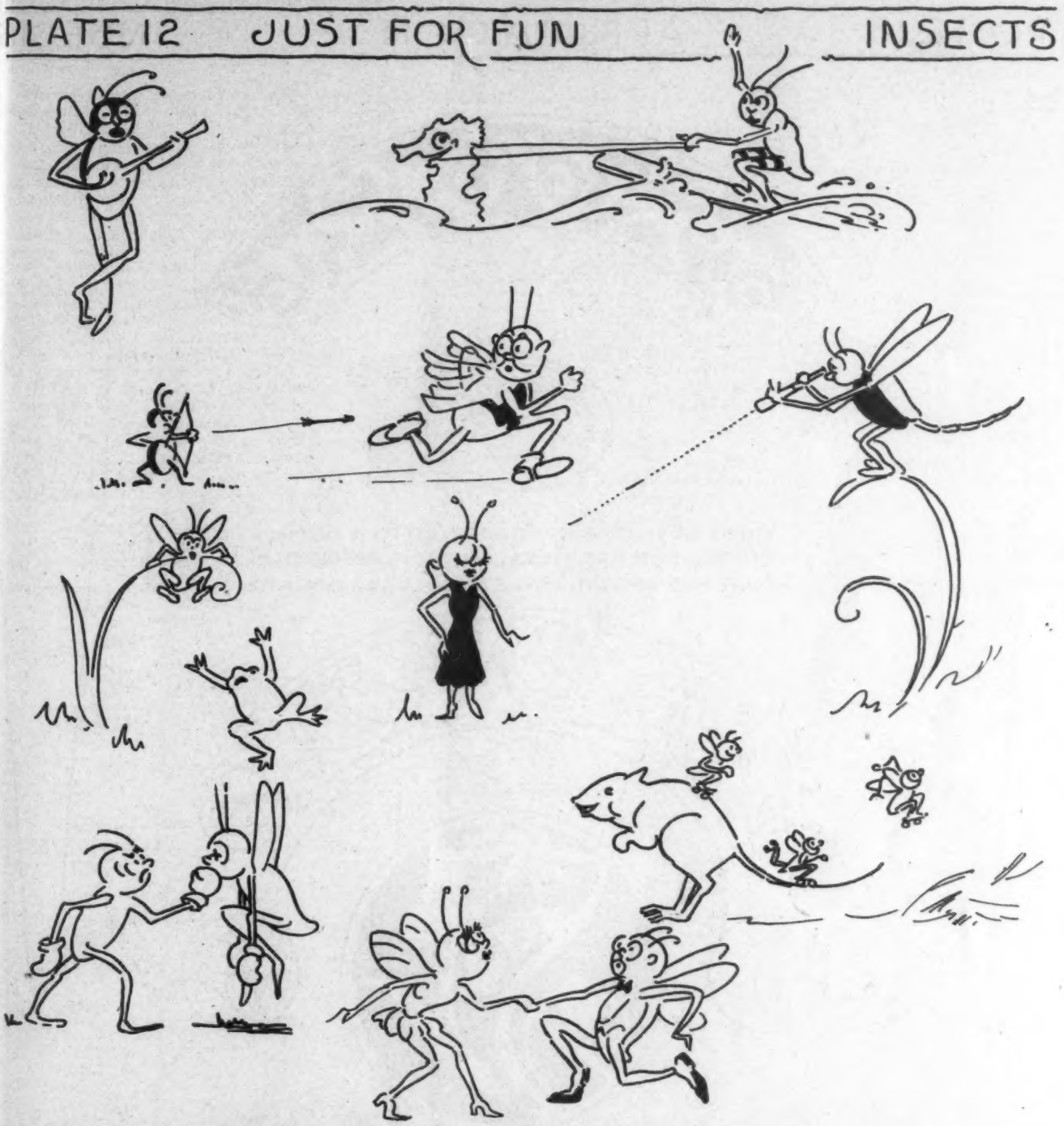


Plate 12. Creative design course by Richard E. Bailey, chairman, art department, Central High School, Providence, R. I.

PLATE 13 APPLICATION INSECTS

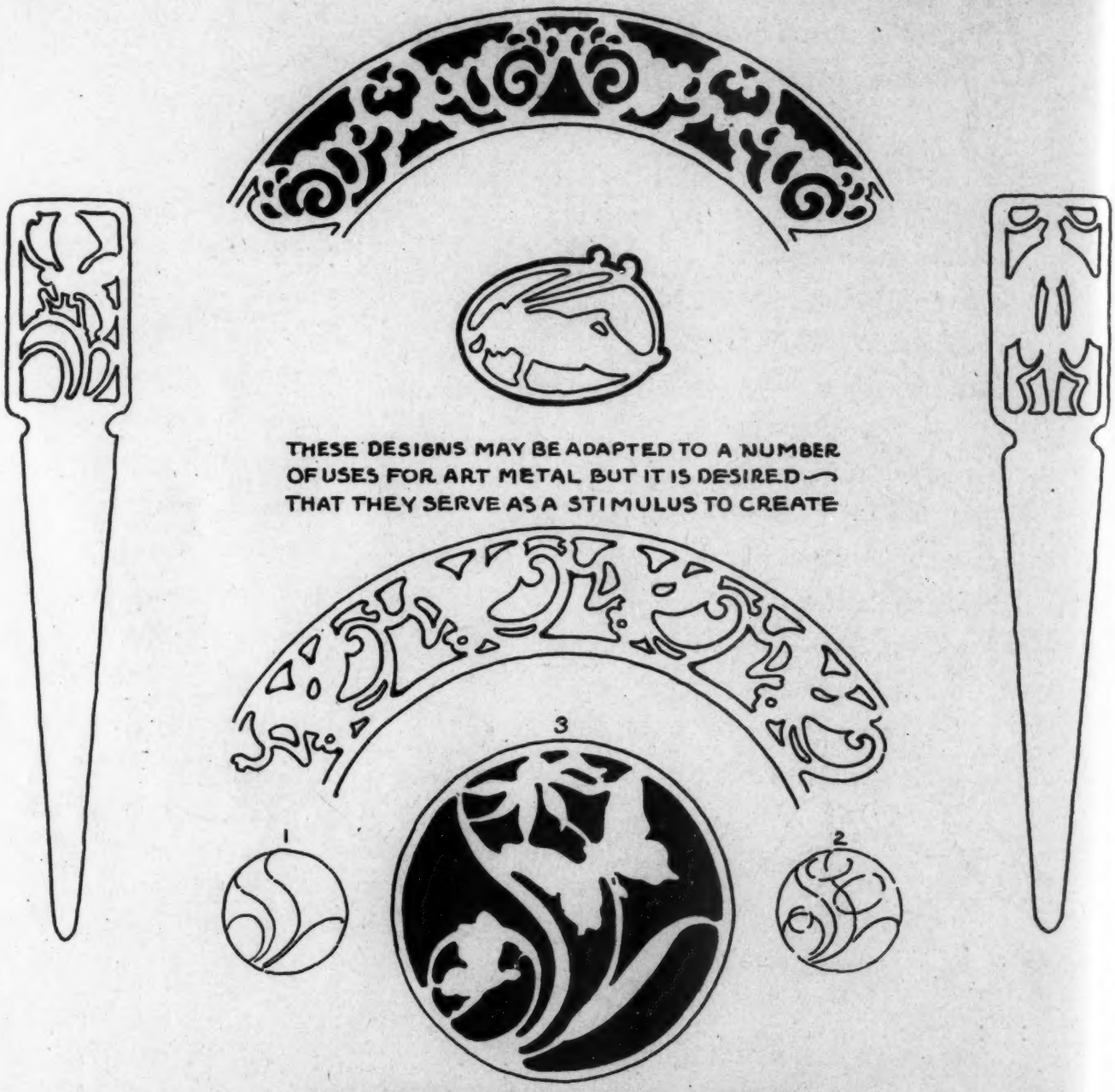

THESE DESIGNS MAY BE ADAPTED TO A NUMBER OF USES FOR ART METAL BUT IT IS DESIRED THAT THEY SERVE AS A STIMULUS TO CREATE
3
1
2
IN A PIERCED DESIGN HAVE ALL JOINED PARTS OF THE PATTERN STRONG ENOUGH NOT TO BREAK IN THE CUTTING

Plate 13. Continuation of creative design course by Richard E. Bailey, chairman, art department, Central High School, Providence, R. I.

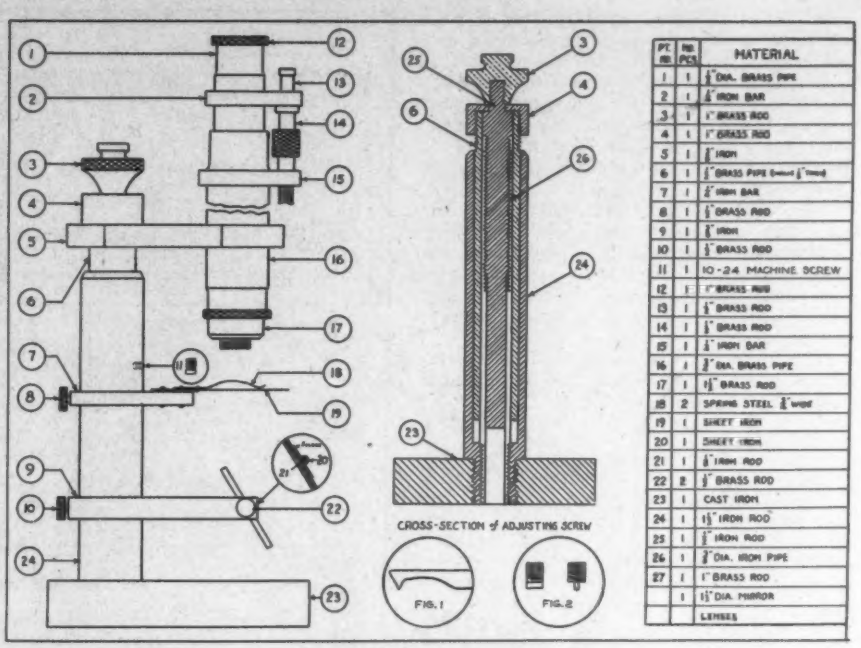
A HANDY MICROSCOPE

JOHN RAINKA
High School
Warren, Mass.

The microscope illustrated in connection with this article is the outgrowth of a project in industrial arts. This microscope, although somewhat similar to the factory product in design and construction is simplified to such an extent that a high school boy can make it. Although the general construction is comparatively simple, it is compact, sturdy, and will magnify to five hundred diameters with satisfactory results.

The making of this instrument offers many interesting opportunities for student activity. Its construction requires the fitting of one piece to another, the cutting of small inside threads using a specially ground lathe tool, as well as making the micrometer adjustment for raising and lowering the body.

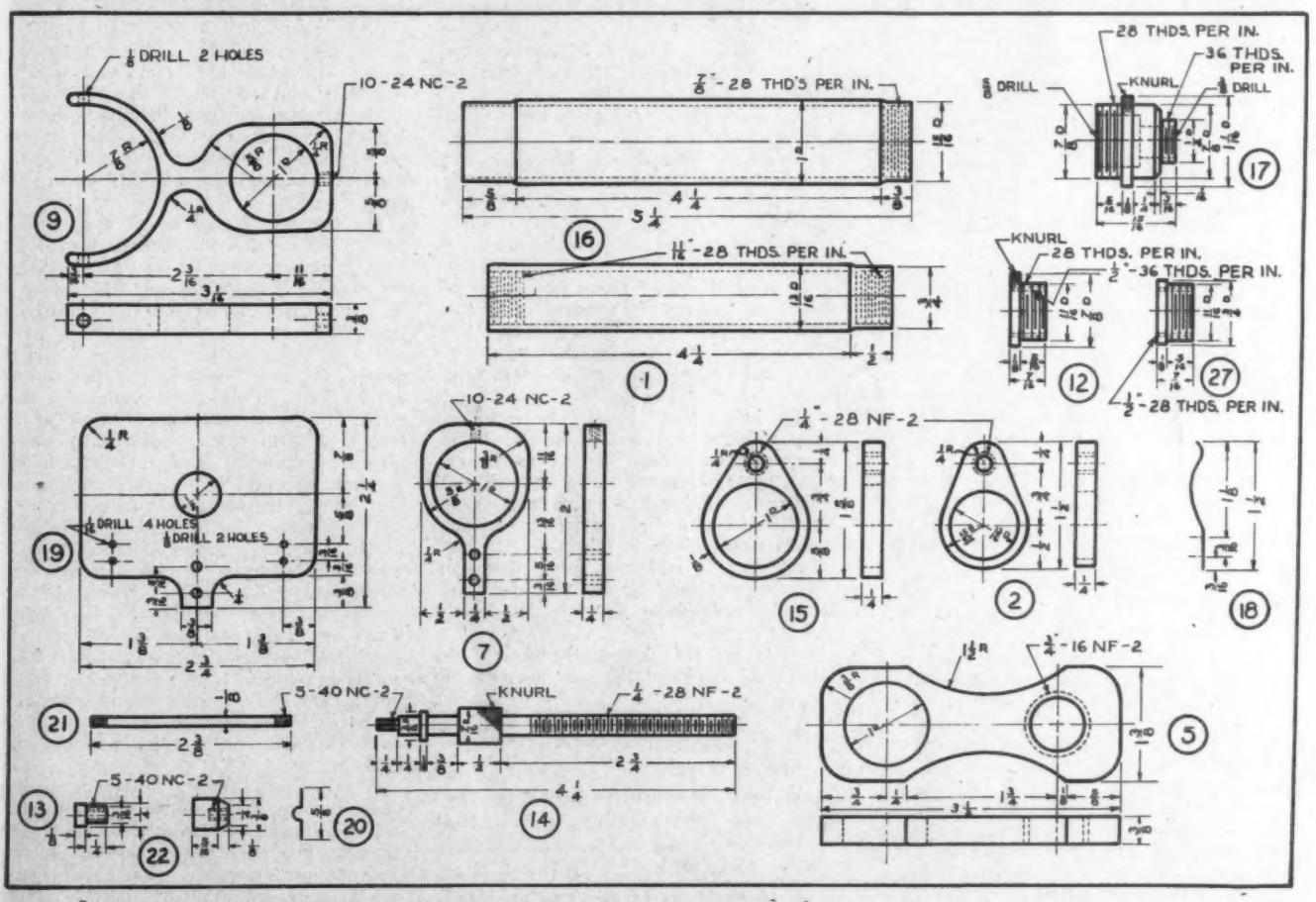
The lens is the heart of the microscope. Lenses with liquids are used for specific purposes, but the common lenses, as we know them, are the glass lenses. The production of glass lenses and setting them in mountings is a delicate and laborious process and involves the most accurate workmanship. The glass must have fixed properties and must be free from blemishes. The lenses must be accurately ground and polished, truly centered, and set in suitable mountings without strain.



PT. NO.	NO. PCS.	MATERIAL
1	1	½" DIA. BRASS PIPE
2	1	¼" IRON BAR
3	1	¼" BRASS ROD
4	1	¼" BRASS ROD
5	1	¼" IRON
6	1	½" BRASS PIPE (turned ⅜" thick)
7	1	¼" IRON BAR
8	1	⅜" BRASS ROD
9	1	¼" IRON
10	1	⅜" BRASS ROD
11	1	10-24 MACHINE SCREW
12	1	¼" BRASS ROD
13	1	⅜" BRASS ROD
14	1	⅜" BRASS ROD
15	1	¼" IRON BAR
16	1	⅝" DIA. BRASS PIPE
17	1	1½" BRASS ROD
18	2	SPRING STEEL ⅛" WIDE
19	1	SHEET IRON
20	1	SHEET IRON
21	1	⅛" IRON ROD
22	2	⅜" BRASS ROD
23	1	CAST IRON
24	1	1½" IRON ROD
25	1	⅜" IRON ROD
26	1	⅜" DIA. IRON PIPE
27	1	¼" BRASS ROD
	1	1½" DIA. MIRROR
		LENSES

Assembly of microscope

The lenses required in this microscope are the objective and the eyepiece. The objective forms the initial magnification which is in turn magnified by the eyepiece. Both of these lenses are designated by their respective magnification numbers which are engraved on



Details of microscope

them. Thus the total magnification of any combination can be found by multiplying the numbers on the objective and the eyepiece.

The focal length of a lens is the distance from the lens to the principal focus. If you wish to obtain a high magnifying power you must get a lens of short focal length. The shorter the focus, the greater the magnifying power.

When using a high power combination, the upper barrel of this microscope can be taken off and the eyepiece put in its place. This can also be done when using low power lenses. If low power lenses are used the magnification can be increased somewhat by using the upper barrel.

The following table shows an approximate magnification power which can be obtained with different combinations.

Objective		Eyepiece			
Focal Length	Initial Magnification	Power	5	10	15
		Focal Length	50mm.	25mm.	16mm.
16 mm.	10	Final Magnification	50	100	150
8 mm.	20		100	200	300
4 mm.	44		220	440	660

Magnification powers with different combinations

Interpretation of the table: The word *power* is a technical term, and it means magnification.

Suppose a final magnification of 300 is wanted. In order to get this, you must obtain an objective with an initial magnification of 20, and an eyepiece which has a power of 15. In other words, 15 (power of eyepiece) multiplied by 20 (initial magnification of the objective) equals 300, or the final magnification of that combination.

This table will be a help in securing the right combination for the desired final magnification.

Special suggestions: The diameters of parts 2, 15, and 16 are a little less than the diameters of the parts they are pressed on.

The parts to which the lenses are screwed should be threaded to suit the lenses secured for the job. The fine inside threads are cut with a tool ground as shown in Figure 1.

Part 11 is a small bolt cut and filed to fit the slot in part No. 6. The shape is shown in Figure 2.

The inside of parts 1 and 16 are blackened to reduce reflection.

PAN-AMERICAN DRAWING EXCHANGE

W. G. HJERTSTEDT
Chicago, Ill.

1. To exchange drawings and other educational material and to accept and assimilate ideas from all Pan-American countries.

2. To establish a permanent educational exhibit to include the work of architectural, engineering, and art students in all Pan-American countries.

3. To bring about international understanding and good will through education and the medium of the school, and to develop toward the people of other Pan-American countries a spirit of tolerance and friendly cooperation.

4. To give for the sake of giving and to give those who are interested in architecture, an accurate knowledge of the architecture of other Pan-American countries.

5. Ethnologically, to study the racial differences in reference to art.

6. To create Pan-American friendly rivalry which is the spur to industrial improvement, the aspiration to useful invention, and to high endeavor in human activity.

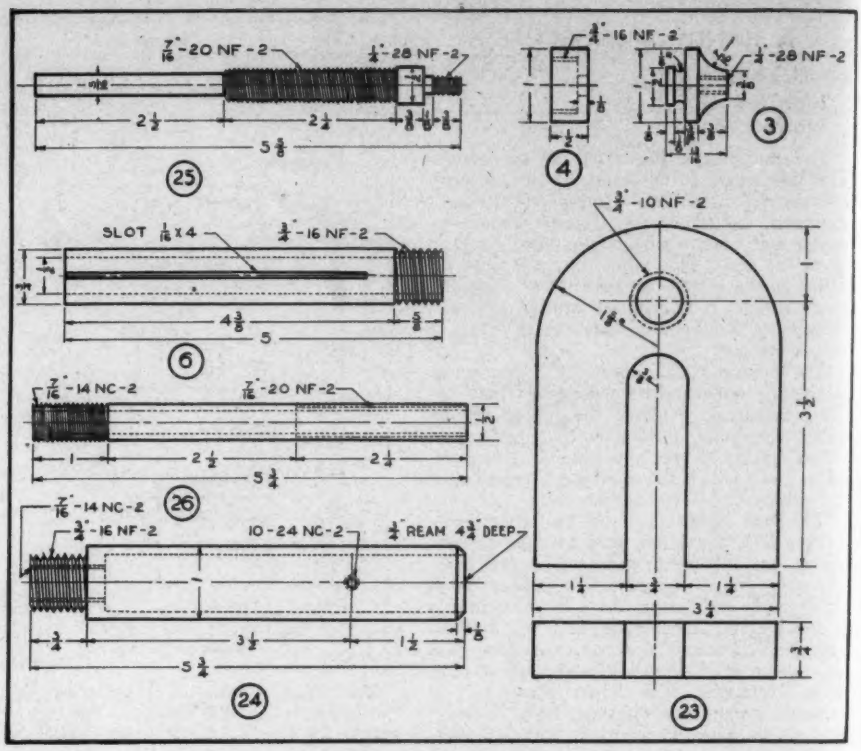
7. To achieve unity between the nations of Pan-America which may lay the foundation for a universal era of peace and good will between the nations of the earth.

8. To exert a direct influence upon the established policy of cooperation between the United States and other Pan-American countries.

9. To bring about a Pan-American exchange of ideas for the advancement of education, and to obtain new ideas in art, architecture and engineering, and mechanical designing from other Pan-American countries.

10. To learn of the accomplishments and difficulties of students in other Pan-American countries, and to inject a spirit of romanticism into the daily routine of school work, and provide an educational diversion for the students.

"Science and art belong to the whole world, and before them vanish the barriers of nationality."



Details of microscope

BEAM TRAMMEL

NAHUM J. ROSEN
Instructor, Mechanical Drafting
Machine and Metal Trades High School
New York, N. Y.

(See assembly and details on page 341)

The urgent need for tools created by the demands of production for war needs have caused a shortage of various tools and instruments which no longer can be bought.

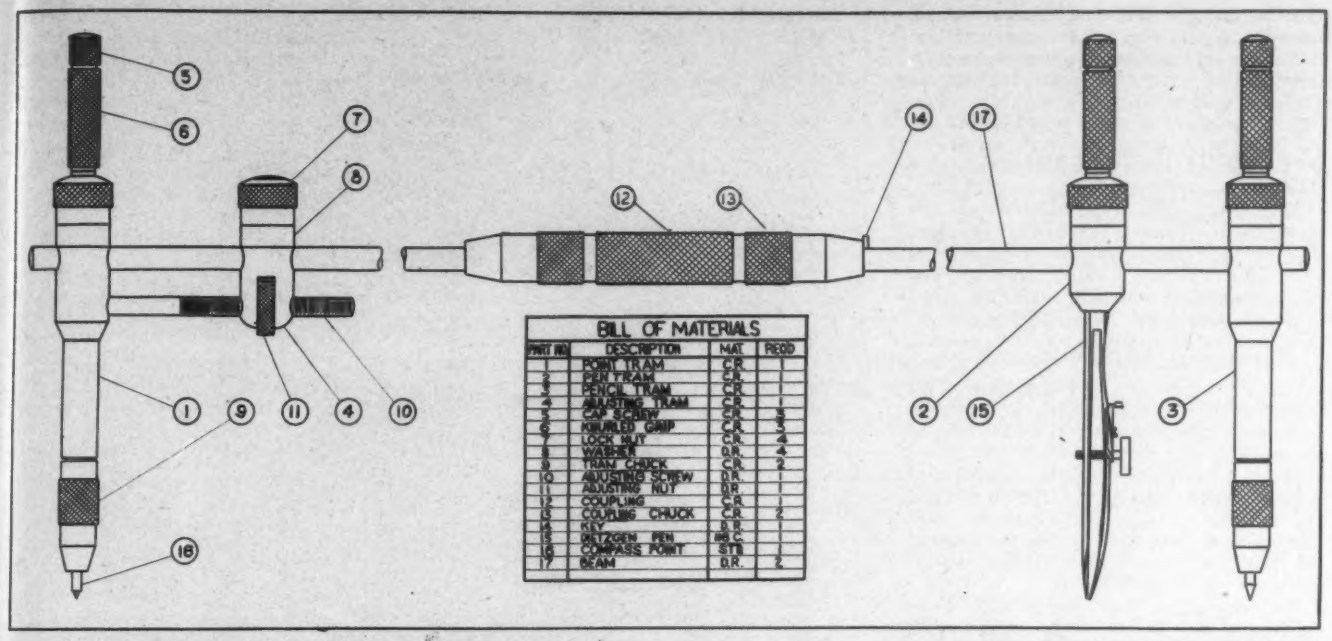
Recent requests from the machine shops and drafting rooms for a trammel or beam compass have produced the following design which was made, built, and used by my students.

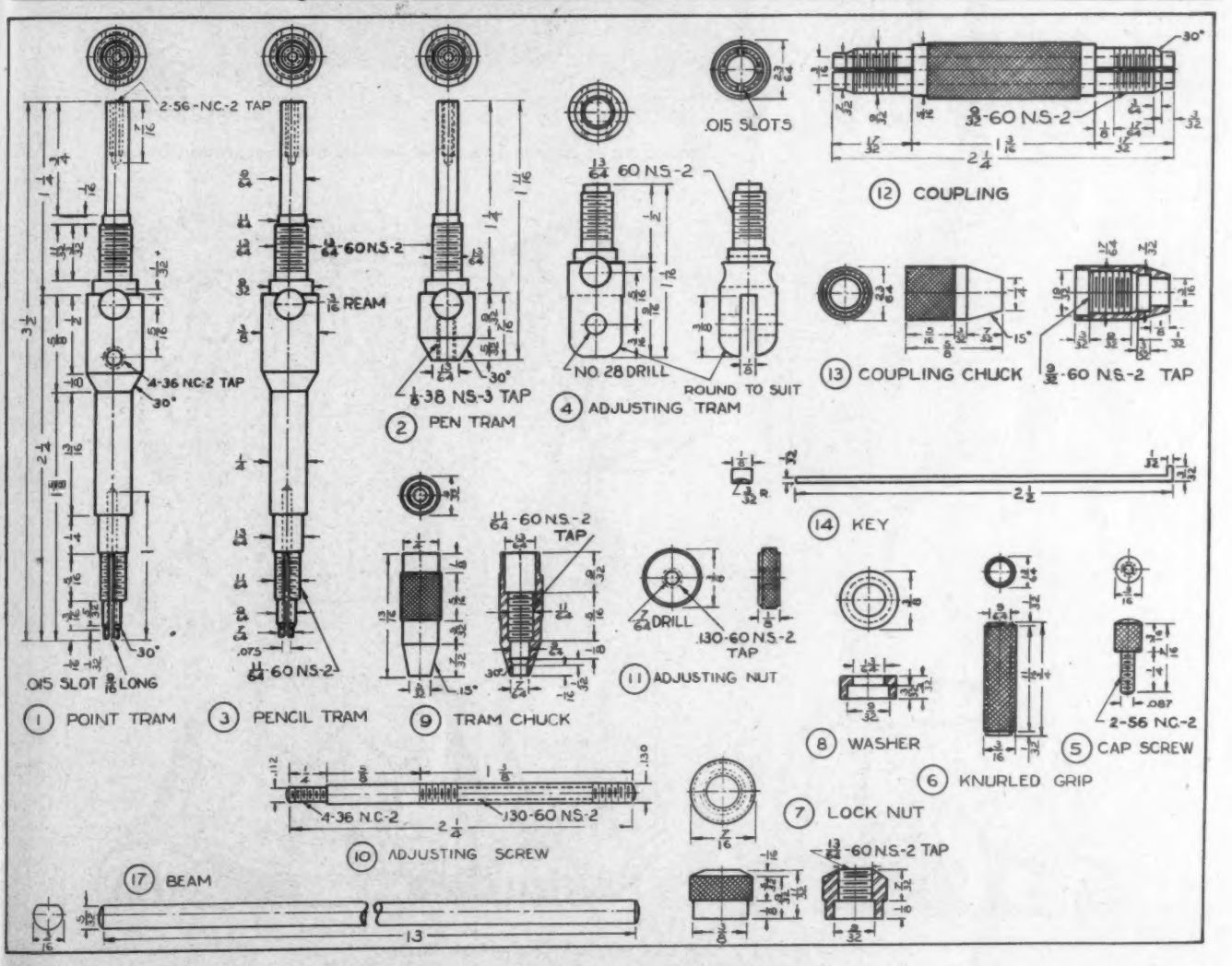
The cost of this instrument usually limits it to machine-shop or drafting-room equipment for general use. Trammels are necessary for drawing large circles and arcs, laying off center-to-center distances, or for transferring large distances.

The assembly drawing in Figure 1, and the details in Figure 2 show all the fine features usually found in well-made commercial trammels. The beam part No. 17 made of two lengths of drill rod ground slightly flat on top can quickly be fitted together and held in place by part No. 12, the coupling, and part No. 13, the coupling chucks.

The key part No. 14 inserted in the length of the coupling provides a full grip on the rods. The threads on the chuck are made fine, but if desired the number of threads per inch can be decreased. The parts No. 1, 2, and 3, which are the point tram, pencil tram, and pen tram, have a special washer part No. 8 and lock nut part No. 7. Tightening the lock nut fastens the trams to the rod, while the washer is forced down on the flat of the rod, thus obtaining the correct position automatically.

For fine adjustment, the point tram is connected by an adjustment screw part No. 10, an adjustment nut part No. 11, designed to make fine adjustments between the point and the pen or pencil point. The compass needle point and lead are quickly adjusted to length and held firmly by the tram chuck


BILL OF MATERIALS
PART NO. | DESCRIPTION | MAT. | REQD
1 POINT TRAM C.R. 1
2 PEN TRAM C.R. 1
3 PENCIL TRAM C.R. 1
4 ADJUSTING TRAM C.R. 1
5 CAP SCREW C.R. 1
6 KNURLED GRIP C.R. 1
7 LOCK NUT C.R. 4
8 WASHER C.R. 4
9 TRAM CHUCK C.R. 2
10 ADJUSTING SCREW C.R. 1
11 ADJUSTING NUT C.R. 1
12 COUPLING C.R. 1
13 COUPLING CHUCK C.R. 2
14 KEY C.R. 1
15 DIETZGEN PEN MISC.
16 COMPASS POINT STD. 1
17 BEAM C.R. 2



Figs. 1 and 2. Assembly and details of beam trammel

part No. 9. The trams are fitted with a knurled grip part No. 16. Ink pen part No. 15 can be easily purchased at drafting supply stores, or this part may be taken from an old drafting set.

WHITTLING-JACKKNIFE TECHNIQUE

W. BEN. HUNT

Hales Corners, Wis.

(Continued from page 298 of the September, 1943, issue)

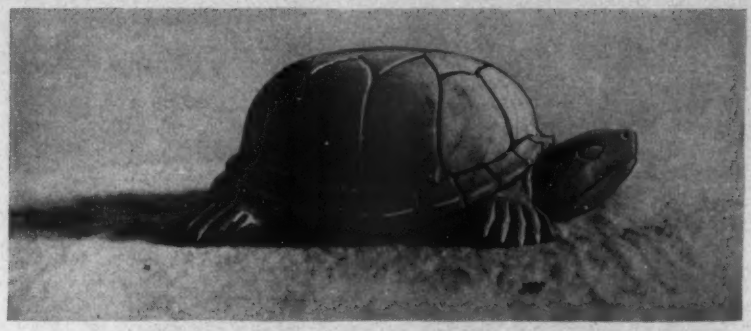
Turtle Paper Weight

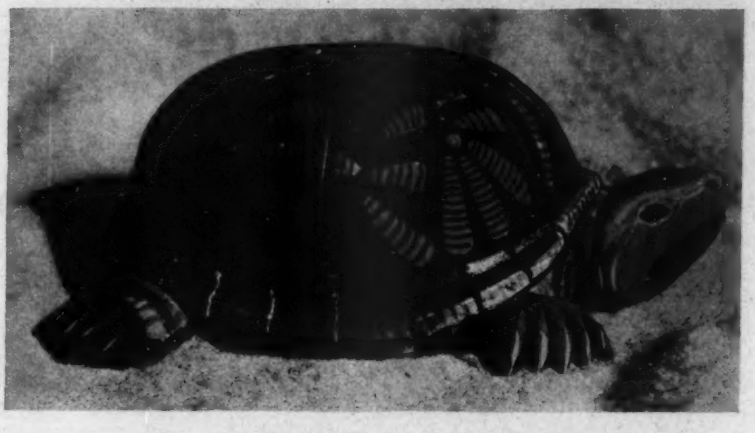
The interesting paper weight chosen for this month's whittling project is known in its natural home surroundings as the painted box turtle.

The first step is to mark the top view of the turtle shown in Figure 131 on a piece of 1½ by 2¾ by 4-in. white pine or other suitable wood, placing it so that the grain of the wood runs lengthwise. Then saw out the silhouette as shown.

The next step is to cut straight down along the edge of the shell to the heights given for the legs, feet, and tail, as shown in Figure 132. Then round up the shell, and use 1/6-in. V-cuts to outline the shell sections. After finishing up the head and feet, sand up the whole piece carefully. Then bore holes in the bottom and fill them with lead or Babbitt metal to give weight to the little reptile.

The painting of the shell has been con-





Sanded turtle above. The turtle with its final decoration below

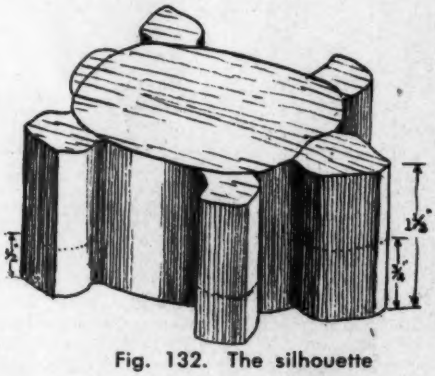
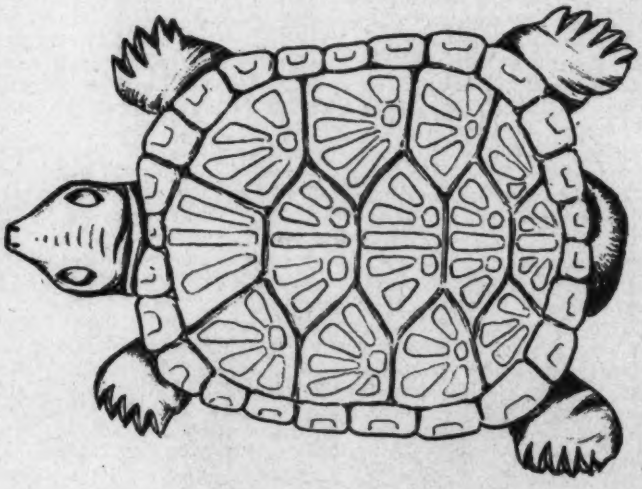
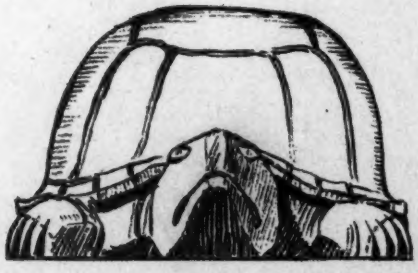


Fig. 132. The silhouette





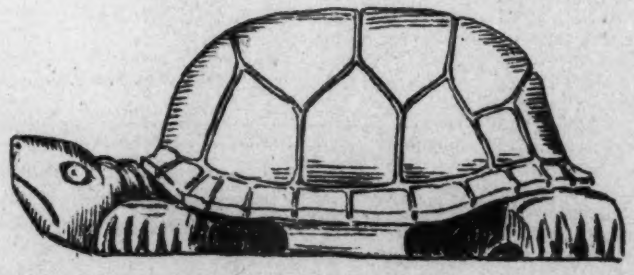


Fig. 131. Full-size pattern of the box turtle

ventionalized somewhat but the general characteristics have been adhered to. The background color is a deep reddish brown, and the smaller figures in the segments are painted yellow with light brown edges and cross lines to soften up the design. The legs, head, and tail are painted gray with a greenish line running from the nose over the eye, and ending right back of them.

Give the shell a couple of coats of clear nail polish for a finish coat.

CHILD'S CHAIR AND TABLE SET

LOUIS BAROCCI
Cudahy High School
Cudahy, Wis.

The child's chair and table set described herewith proves a popular Christmas season project for the school woodshop. The project is not too difficult for the boy who has had several semesters of woodwork nor will it take a great deal of time for its construction.

Birchwood with a natural finish of bright varnish makes a good practical combination.

INDUSTRIAL ARTS AND SALVAGABLE MATERIALS

JEROME LEAVITT
Verona, N. J.

During this emergency, teachers must develop and practice better consumer habits in our schools. Now, when materials are becoming scarce and the importance of our work is increasing, we must, from necessity, find substitutes for some of the materials and supplies that were formerly used. Some of these are strategic war materials and can be no longer procured, and others are high in price and the quantity limited. There are many kinds of materials that can be salvaged and conserved. Some of these are listed here.

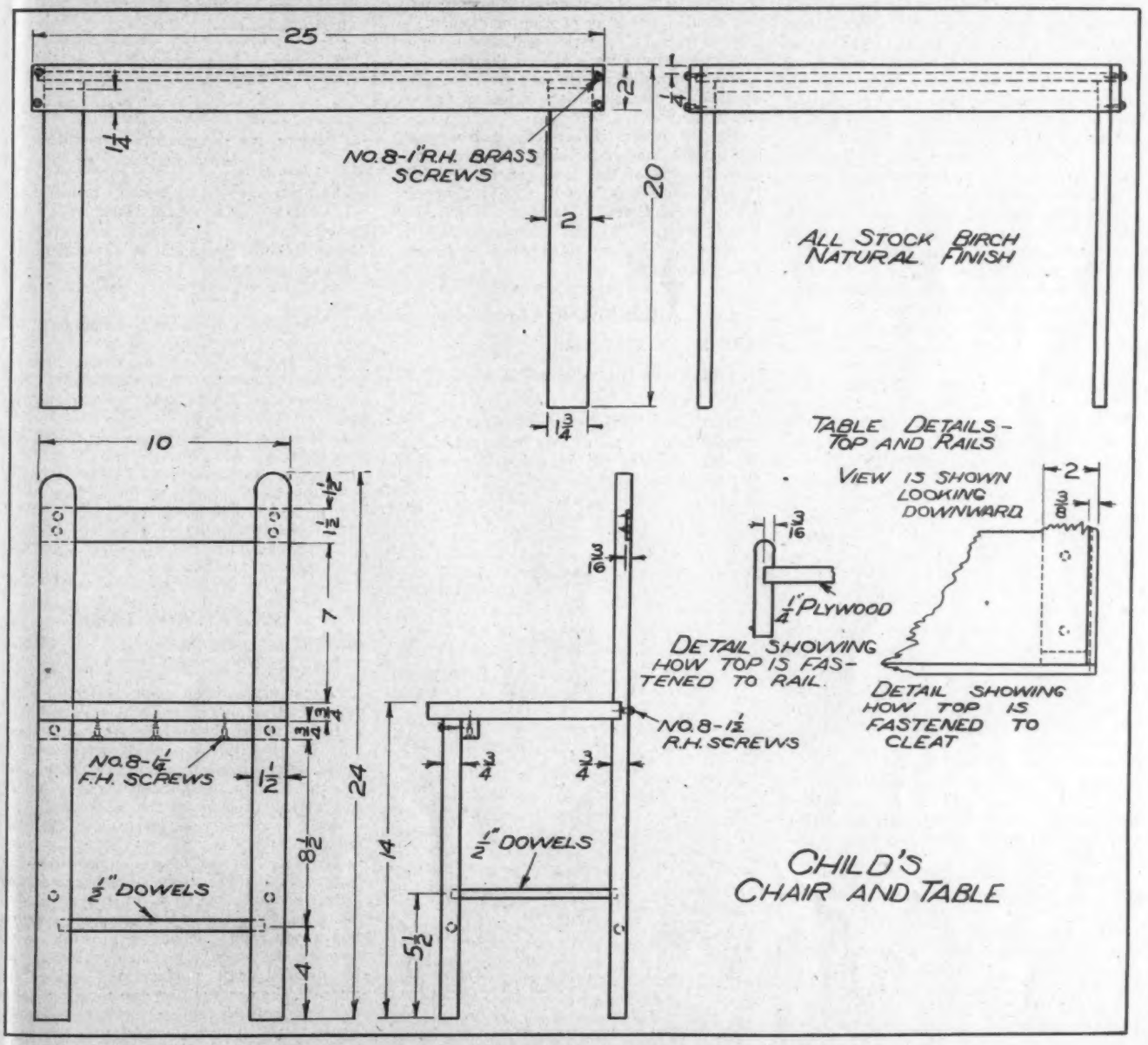
Aluminum utensils may be cut down the sides, flattened out, cleaned and used in the making of trays, dishes, and bowls.

A brad awl may be constructed by driving a six-penny finishing nail into a piece of broom handle six inches long, and then grinding the head of the nail to a point.

Broom and mop handles make very good dowel rods, and are adaptable to a variety of uses if sandpapered smooth.

Burlap bags, if slit down the sides and washed, may be used as the base for hooked rugs. Blackboard chalk takes well on this material, and very artistic designs can be drawn preparatory to hooking. The burlap should be securely fastened on a frame.

Cardboard boxes of the smaller sizes make toys and doll furniture when cut and joined together with fasteners.



Child's chair and table set, submitted by Louis Barocci, Cudahy, Wis.

Cardboard boxes may also be used to store and protect materials and supplies in.

Cement and feed bags, if opened out and washed, furnish very durable material for shop or art-room aprons. The making of the aprons would be a valuable experience for boys as well as girls.

Coat hangers made of wire may be taken apart, straightened, and then used as wire.

Dry cell batteries, when carefully taken apart, may be used as a visual aid in the demonstration of the make-up of dry cells.

Burned out electric light bulbs may be used as a base for making papier-mâché heads. When the papier-mâché is dry the bulb is cracked and removed.

Felt and wool remnants may be cut in strips about ½ in. wide and woven into all sorts of mats. The strips can be cut from old articles or material secured from manufacturers.

Grease, as we know, is the basis of soap. When six pounds is mixed in the proper proportions with one can of lye about three dozen cakes of soap may be made. (For the recipe see the label on a can of commercial lye.)

Inner tubes may be split open, cut in the shape of animals, sewed together, and stuffed to form novel toys.

Jars of all sizes, with lids, may be used for storing nails, screws, and other small parts, or for mixing paints, glue, etc.

Logs, tree branches, and trunks may be split or used natural in the construction of rustic furniture. Cedar and pine are ideally adapted to this. Suggestions may be found in "Rustic Construction" by W. Ben. Hunt, The Bruce Publishing Co., Milwaukee, Wis.

Lead from batteries, sinks, and other sources may be melted down and used in molding.

Magazines, newspapers, scrap paper, and cardboard may be collected and sold. This not only helps the government in their waste paper campaign, but will also provide additional funds to purchase materials.

Metal scrap cuttings and old useless articles made from copper, brass, aluminum, or iron, such as tooth-paste tubes, iron pipes, pans, etc., should be saved and sold by the pound.

Milk cartons and caps make useful containers in which to mix paints or other liquids, and when the job is completed the container can be thrown away.

Newspaper may be used to protect benches. It also may be torn up into strips and used for making papier-mâché.

Orange crates, butter tubs, and nail kegs may be cut down by younger elementary school children and made into usable children's furniture.

Phonograph records may be boiled for a few minutes in hot water and pressed to the bottom of the pan until they form a bowl. These bowls, after having been allowed to dry, may be painted or finished to suit one's taste.

Plastics are now being manufactured in a great many colors and sizes so that, in many cases, they may be used in art metal and jewelry work. For lists of concerns supplying these and suggested projects see the "School Shop Annual" of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION MAGAZINE.

Rags of all colors may be cut in strips and used for hooking rugs. They may also be washed, dried, and used for cleaning.

A razor blade, when split down the center and soldered to a brass or copper rod the size of a pencil, makes an excellent knife for cutting out a variety of work in model making.

Rope may be braided and used as the sole of moccasins made of raffia.

String, if dyed in different colors, may be woven into interesting small mats.

Tar paper scraps from construction work will provide excellent roofing material for birdhouses.

Tin cans provide an unlimited number of projects. Save these in advance as the various sizes may be limited later. For suggestive projects see "55 New Tin Can Projects" by J. J. Lukowitz, The Bruce Publishing Co.

Copper washtub bottoms may be cut out and made into very attractive ash trays and plates.

Wax from beehives, jelly jars, and old candles may be melted down and made into new candles, either by pouring or dipping.

Wire from old electric appliances may be used in numerous ways around the shop.

Wires from milk bottle caps are convenient to have in the shop for fastening various things together.

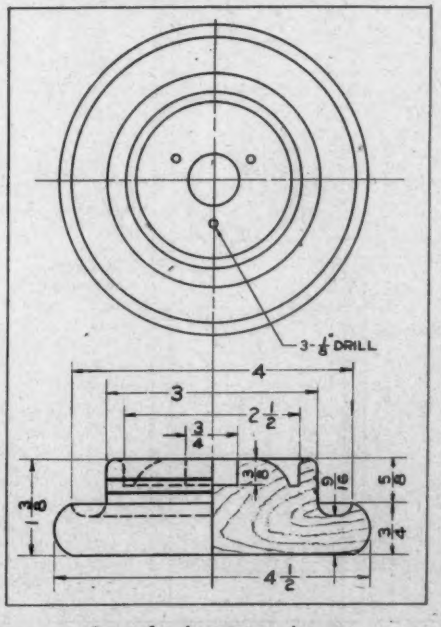
Wooden boxes, if carefully taken apart, will provide lumber for simple beginner projects. Projects of this type can be found in "Junior Handicraft," by R. C. Cramlet, published by McCormick-Mathers Co., Wichita, Kans., and in "Unique Simple Toys," by Klenke, published by McKnight & McKnight, Bloomington, Ill.

HURRICANE LAMP

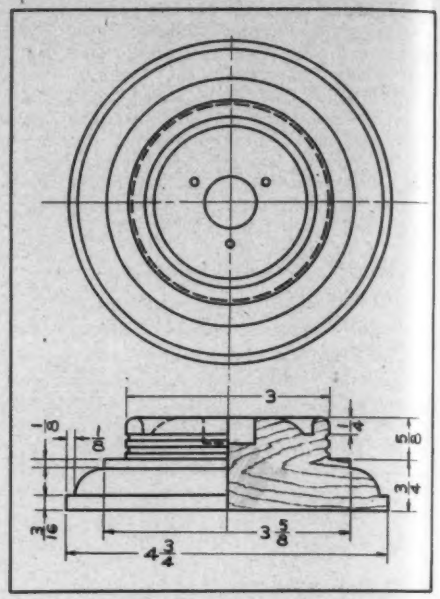
ARTHUR O. GARDNER

Bay View High School
Milwaukee, Wis.

Hurricane lamps, like candlesticks, are usually made in pairs. Two types are shown. Be sure to hold to the dimensions because variations are easily detected.



Base for hurricane lamp



Alternative design of hurricane-lamp base

The procedure for both lamps is identical.

1. Glue a 3½-in. square block on a 5-in. square block of ⅞-in. stock. Use gum or walnut. Be sure grains run in identical directions. Use hot glue and clamp evenly.
2. Cut off corners and attach to a face plate.
3. Turn down to correct dimensions. Be sure to obtain the lamp chimney before cutting out the groove into which the chimney fits. Then remember that the outside wall of the groove should hold the chimney in place.
4. Mark and center punch for the ⅛-in. vent holes.
5. Finish as desired in the lathe.
6. Glue blotting paper or felt to base.
7. Drill the three ⅛-in. holes.
8. Attach three rubber covered tacks evenly spaced to the base so air vent holes are effective.

GLOBAL WAR TANK

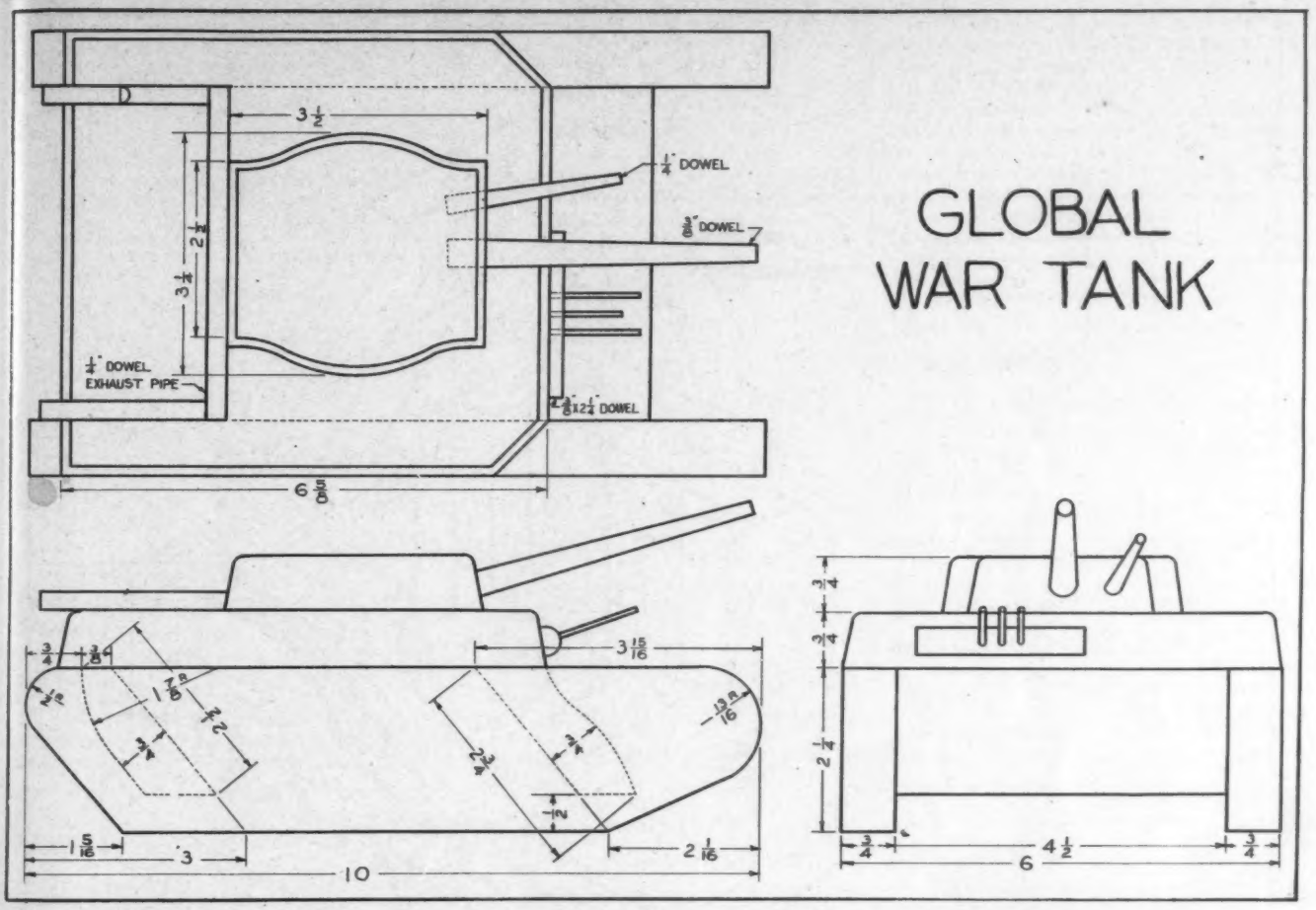
JAMES MC GREGOR

Pasadena, Calif.

Present tanks, with their powerful guns, differ greatly from those used in World War I. In the model shown herewith it is important to have the two sides correspond in shape, and their edges square. To do this the two pieces may be bradded together lightly and worked to shape at the same time. This is done, of course, after each piece has been individually sawed.

Templates for the curves on the front and back pieces will be useful. The shape should be marked on both ends of the wood. By doing this lines can be drawn on the sides of the wood, giving something to work to in beveling the edges. Convex curves can easily be rounded with a plane and sanded off smooth. The concave curve on the front piece can be done with rasp, cabinet file, and sandpaper.

The top has ⅛ in. bevelled edges all around.



The turret is made to the exact size of its base. One eighth inch lines are then marked all around the top, and side and end edges are bevelled with a cabinet file. All sharp edges of top and turret are rounded.

The large gun is worked from square stock in softwood. This will aid the student in his learning processes better than handing him a piece all ready rounded. Tapering of this gun is done first in square fashion before rounding. It is tapered from a 3/8-in. square to a 1/4-in. square section.

Exhausts are 1/4-in. dowels planed flat to fit the top. These are bored and fastened with brads. Boring can be done by cutting the head off a brad with pliers, and using the brad as a drill point. This will prevent the breakage of valuable drills.

The gun emplacement for the smaller coupled guns is a 3/8-in. dowel planed flat to fit the front edge of the top. Two 8d, and one 4d finish nails, with heads cut off, are used for the coupled guns.

Although this model does not provide a container compartment a bottom may be installed and the top made removable.

Minute details have been omitted in this model to simplify construction for younger boys. One detail which can be added, however, without much time is the tread markings at exposed points. Instead of gluing on blocks to resemble treads, a simpler and still effective method, is to mark off square lines 1/8 in. apart across the edges of the sides, and cut these in with the sharp edge of a cabinet file.

BILL OF MATERIAL

No. of Pcs.	*Name*	*Size*
2	Sides	1/4 x 2 1/4 x 10
2	Front and back	1/4 x 2 3/4 x 4 1/2
1	Top	1/4 x 6 x 6 5/8
1	Turret	1/4 x 3 1/4 x 3 1/2
1	Gun	1/2 x 1/2 x 9 dowel
1	Gun	1/4 x 1/4 x 6 dowel
1	Gun emplacement	3/8 x 3/8 x 2 1/4 dowel
1	Exhaust	1/4 x 1/4 x 10 dowel

ELECTRIC KILN

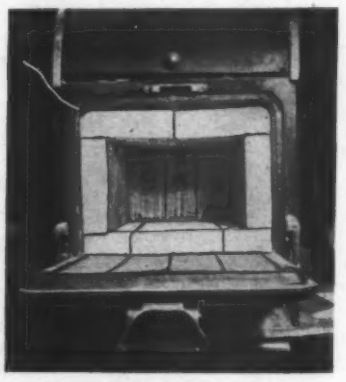
HAROLD GLUCK and
PAUL H. TANNENBAU

William Howard Taft High School
Bronx, N. Y.

Any handy person can build this simple electric kiln, using only a few tools which can be found in the average home. It can be connected to a 110-volt power line that is properly fused. The line must be heavier than the standard home wiring, since it must be fused for 30 amperes of current.

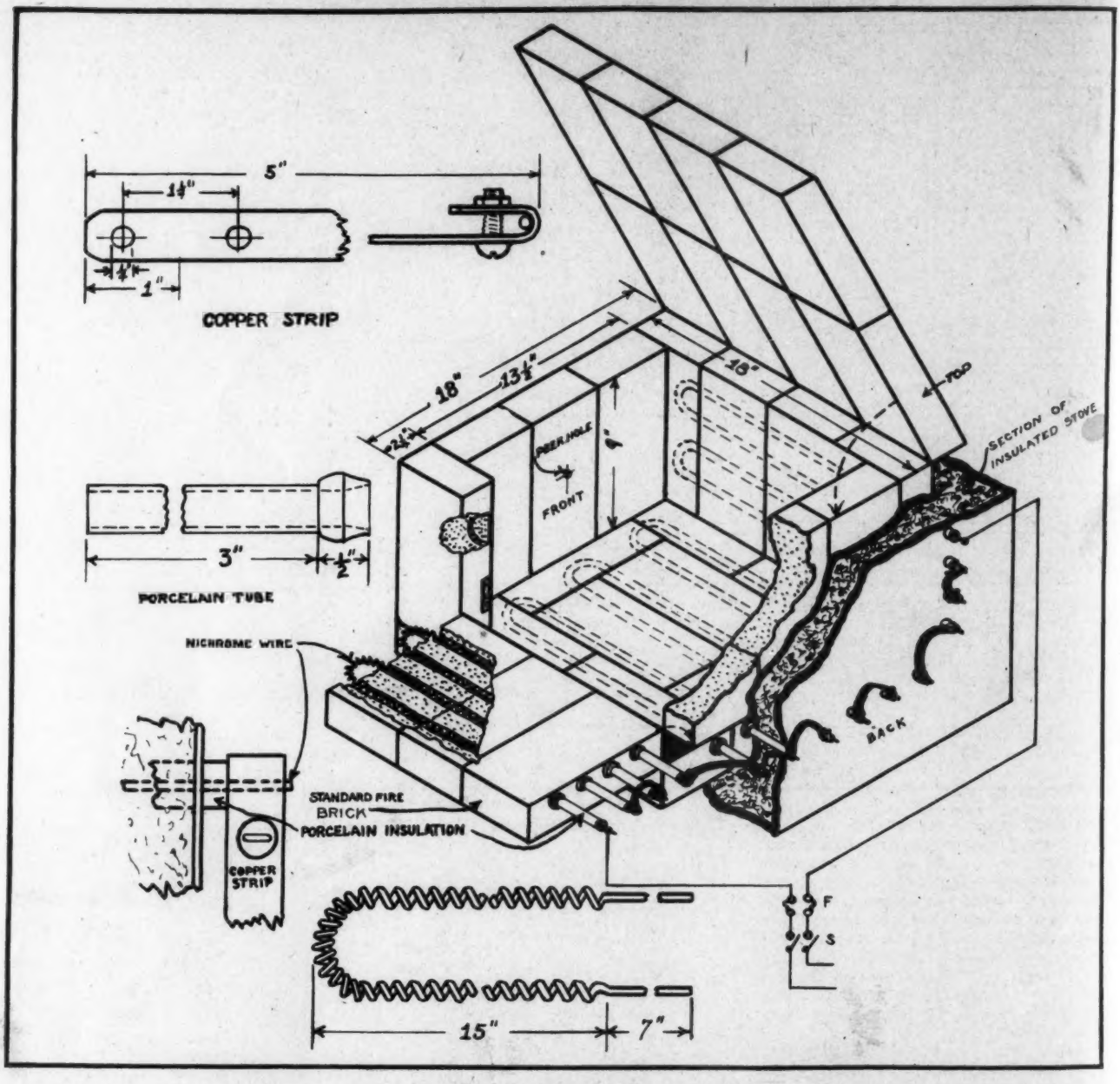
An old stove with an insulated oven picked up at a junk yard, will serve admirably as the outer framework. Lined with firebrick and equipped with heating coils, the kiln will produce pottery as beautiful as pieces fired in expensive factory-built equipment. The saving is several hundred dollars.

The back and front of the oven should be drilled or punched as indicated in the scale drawing. The peep hole in front is kept covered or plugged with clay during the firing. Porcelain tubes are inserted in each of the drilled holes at the back to prevent the wires from coming in contact with the metal sides of the oven.



Electric kiln

The nichrome wire is wound around a 1/4-in. dowel rod so as to form a tight coil of uniform diameter throughout. To save time, this can be done on a lathe, drill press, or with a hand drill. Each coil is made from 154 in. of wire, leaving about 7 in. at both ends for making connections. The coils are made separately rather than in one continuous



Details of electric kiln

length so as to make replacements quickly and inexpensively, should one of the seven sections of wire burn out.

The firebrick used is of the type made by burning out cork that has been mixed with the clay, thus leaving a very porous and light material that is easily rasped or drilled. The bricks must be arranged in the kiln so as to fit tightly in place without cement. Determine which bricks require trimming and rasp them with an old wood rasp or coarse tile. When the trimming is completed and the bricks fit correctly, remove them and lay out the 2 sides and bottom (which are to receive the coils) into panels, separating only one brick at a time to avoid a mistake in connection with drilling the ¾-in. holes into which the heating coils will be inserted. The drilling can be done easily with a brace and electrician's bit, or an electric drill. Try to keep the holes ¼ in. below the surface of the brick, although an occasional break-through will not affect the operation of the kiln. However, breaks in the bottom will leave the heating coils exposed to drops of glaze and other clay materials. They should be protected in this case with a tile.

As the drilling of each panel is completed, insert the coils and put the whole panel in place in the oven. When all the bricks are in place, the ends of the coils are connected in series at the back of the kiln, using the ½-in. copper jumpers and bolts. Be sure to connect one coil with the next, not to both ends of a single coil. The wire at each end is connected to the 30-ampere switch, using No. 8 wire. The switch may be mounted on the kiln or on a near-by wall. The circuit should be connected to a fuse box which is fused for 30 amperes of current.

At 117 volts the kiln will draw 23.7 amperes current, the resistance being approximately 4.5 ohms. This is equal to 2772.9 watts, costing about 50 cents for 6 hours firing.

LIST OF MATERIALS

I. Insulated oven
   a) Inside dimensions 18 by 18 by 14 or thereabouts.

II. 30 Insulating firebrick
   a) Size — standard 9 by 4½ by 2¼
   b) Heat resistance — 2000 degrees F.
   c) Place purchased — Armstrong Cork Co.
   d) Price — 14.7 cents each in lots of 25 *Total cost* $ 4.41

III. 80 Feet nichrome V wire
   a) Size — No. 10
   b) Resistance — 0648 ohms

c) Temperature resistance — 2000 degrees F.
d) Place purchased — Driver Harris Co., Harris, N. J.
e) Price — 16 cents per foot.
Total cost 12.80

IV. 14 Porcelain tubes
a) Size — 3 in. by ½
b) Place purchased — hardware store
c) Price — 2 cents each
Total cost .28

V. Accessories
a) 6 copper strips — 18 gauge B&S ½ by 7
b) 14 stove bolts with nuts — ¼ by ½
c) 5 feet of No. 8 wire in BX cable
d) 30 ampere switch *Total cost* 1.51

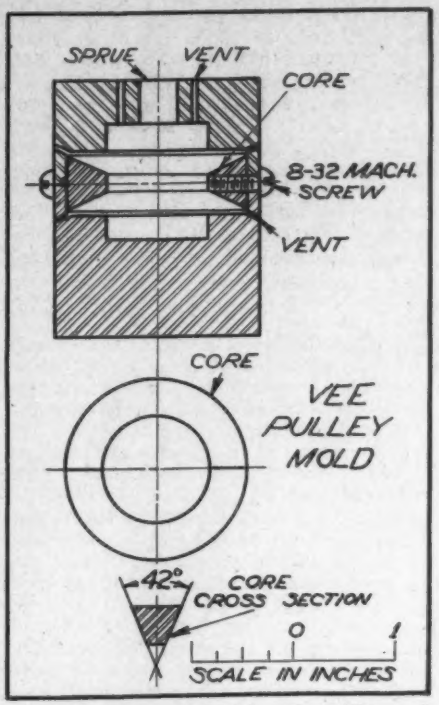
Electrical data *Grand Total* $19.00
a) AC or DC current 110–120 volts
b) Resistance — 4.5 ohms
c) Amperes drawn at 117 volts — 23.7
d) Time to fire to cone .06 or 1830 degrees F. — 6 hours.
e) Kilowatt hours — 16.6374
f) Cost of firing at 3 cents per kw. hour — 50 cents

CAST ALUMINUM PULLEYS

STANLEY G. HAGEN
Sheboygan, Wis.

Our welding class chose to fabricate a small bench grinder. This brought up the problem of supplying V-type pulleys.

Since some scrap aluminum was available, it was decided to make a steel mold so that they could be cast, as this introduced a study of the elementary principles of molding and casting.



The mold and core were turned from mild steel. The core was sawed into two equal halves after the machining operation. Each core piece was then drilled and tapped for an 8-32 machine screw.

The aluminum is melted in a small graphite crucible, using a heavy duty soldering furnace to supply the heat. Before pouring, the mold is heated to approximately 900 deg. F., to prevent the aluminum from *freezing* upon contact with the steel. Then the molten metal is poured into the mold and after solidification, the entire mold and contents are cooled in cold water.

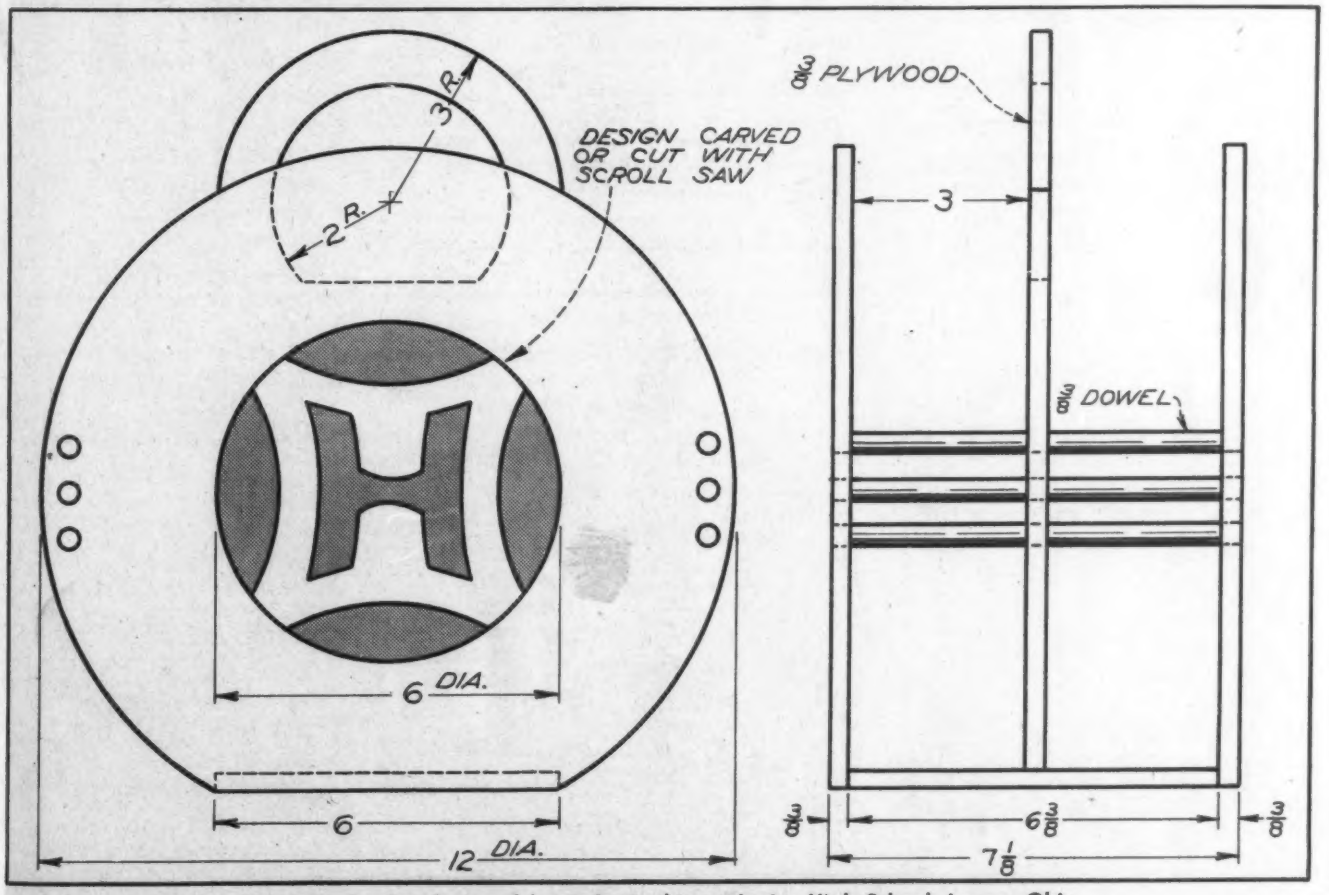
The pulley requires no machining other than boring the proper size hole, facing the hub ends to finished length, and drilling and tapping the pulley for a ¼-in. setscrew.

A TOOL PANEL FOR THE GENERAL SHOP

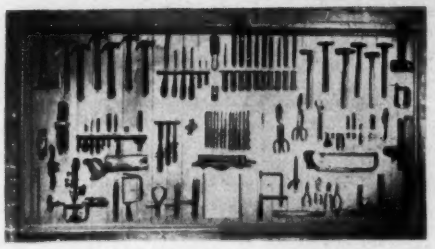
JEROME ISROW
High School
Suffolk, Va.

This all-purpose tool panel was constructed to improve the efficiency of shopwork in general. On the panel the student can find the hand tools required to do the jobs met with in the general shop.

Each tool has been conveniently and securely suspended, each one is numbered, and a silhouette of each tool appears on the board of the panel. In the center is a tool index where all the tools are listed by their corresponding numbers. The tools themselves have



Magazine basket designed by J. R. Hankison, Junior High School, Logan, Ohio



been marked in order to identify them as belonging on the panel.

MODERN SEWING CABINET

ROBERT E. OWEN
High School
Romeo, Mich.

Designed for the lady who has a hobby in sewing, this modernistic cabinet has plenty of room in which to store material and supplies. The design is different, yet very pleasing in color and is practical to use. Most conventionally designed sewing cabinets lack color and storage space. Women demand both of these today.

The material required to build this cabinet is inexpensive. Only one sheet of four by eight fir plywood is needed. This includes material for the two trays inside the cabinet.

If the project is to be painted, the direction of the grain makes little difference when laying out the pieces on the plywood sheet. On the other hand, to obtain the best surface effect for a clear finish, the pieces must be laid out so that the grain runs in the direction of the longest dimension. Along with this latter type of finish, the flower and vase design should contrast slightly with its background. This may be accomplished either by cutting the pieces from different colored woods or by varying the shade or the kind of stain. The design on the ends of the cabinet may be altered to suit the individual but it must remain a conventional or geometrical design which is in harmony with the contours of the structure.

If, after the larger pieces of the cabinet have been cut and are to remain a day or so before being assembled, they should be clamped or weighted to a flat surface to prevent any possibility of warping.

In assembling, all the joints should be glued as well as fastened with finishing nails. Sink nail heads below the surface and fill the holes with a suitable filler or plastic wood. Fasten the handle to the top piece with countersunk screws. This is, of course, done before the top piece is fastened to the ends by the same method.

To keep the cabinet from tilting if placed on an uneven floor or rug, the flowerpot bases may be lowered about ⅛ in. below the body of the cabinet. This will lessen the points of contact along the bottom ridge and provide a better footing at the ends.

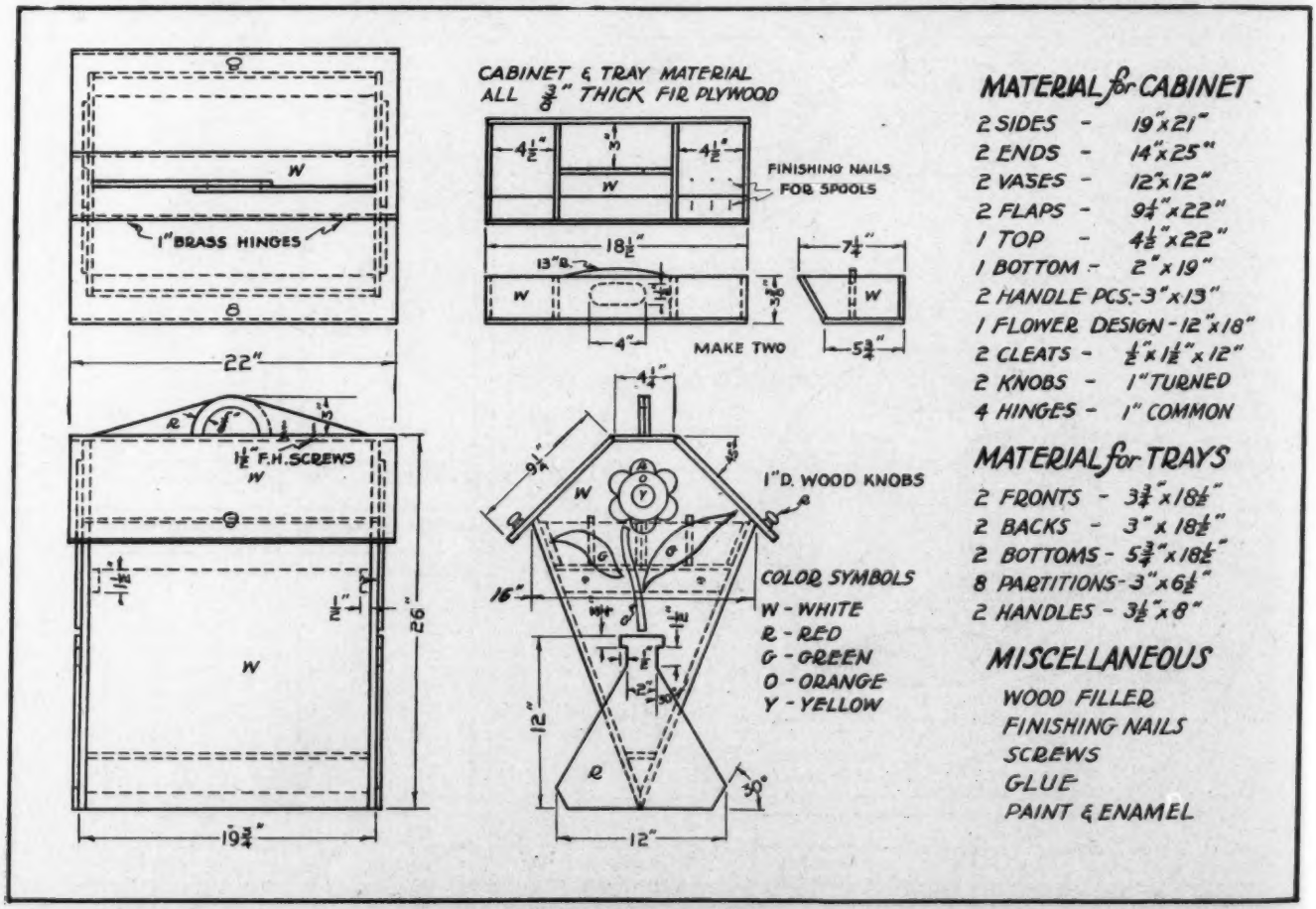
After the assembled project has been well sanded and wiped free of dust, the finish must be considered. White will harmonize well with the surroundings of any sewing room as it is a neutral color. Starting with the inside of the cabinet, two coats of enamel undercoating or flat white should be applied over the entire project. These coats should be lightly sanded before the final coat, enamel, is flowed on. If synthetic enamel is used, apply four-hour instead of one-hour dry as the more rapid drying finish will soon fade to an odd creamish color. The bright colors, red, orange, yellow, and green tend to further accent the white and make the sewing cabinet a piece of furniture of which any woman may well be proud.

A HUNTING KNIFE AND SHEATH

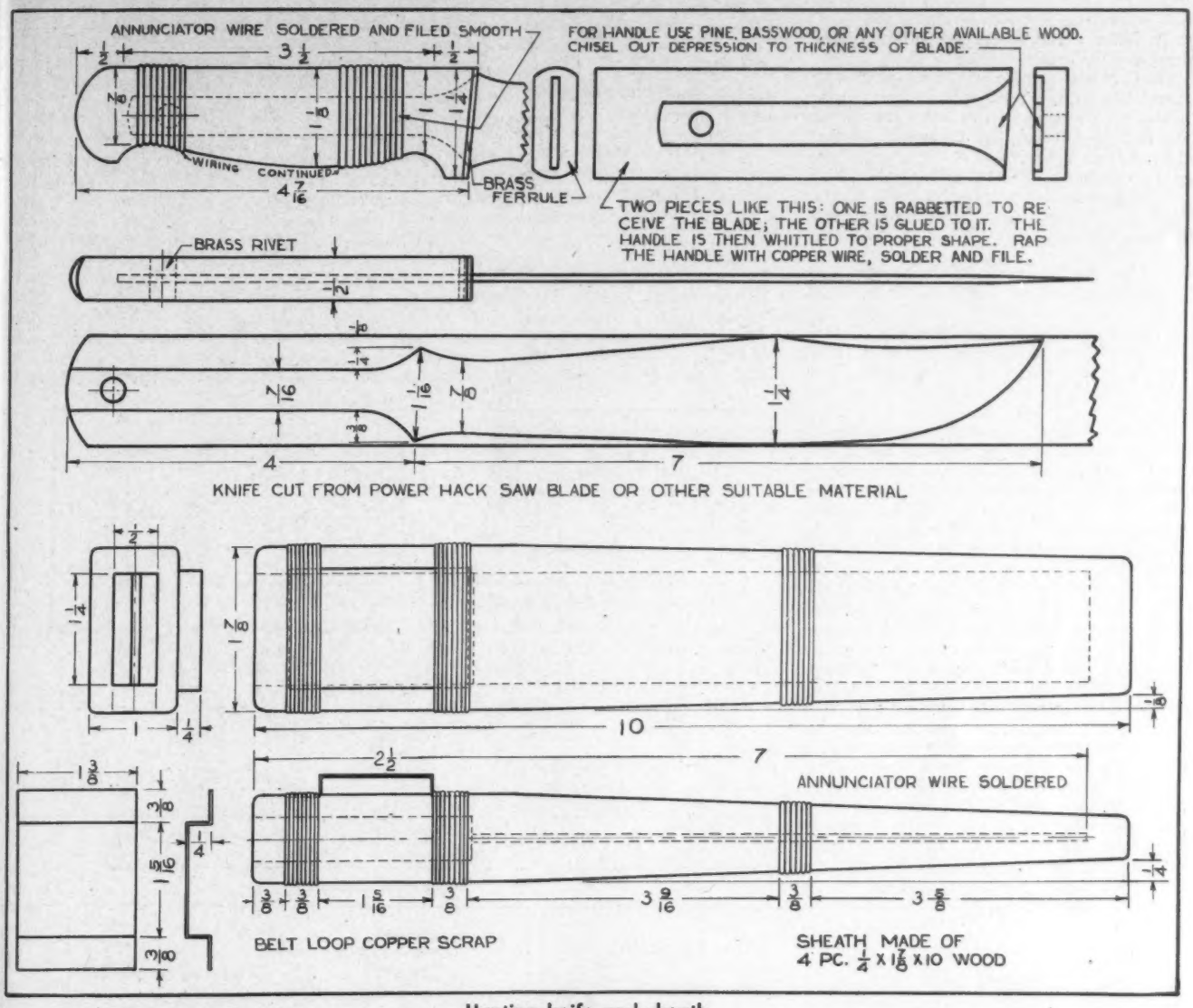
RUSS WENKSTERN
Ironwood, Mich.

The only vital materials used in this knife and sheath are 30 ft. of annunciator wire, some solder, and a little scrap steel, and wood.

This particular plan shows the blade cut from an old power hack-saw blade. However, even more suitable scrap can be used as the steel used in the hack saw is very hard. Do not try to anneal it. Try to retain full thickness of the blade wherever possible. It is somewhat thin, so it is not advisable to sharpen the edge hollow ground. A very keen edge can be put on this steel, but as it is brittle, never throw this knife.



Modern sewing cabinet


ANNUNCIATOR WIRE SOLDERED AND FILED SMOOTH
FOR HANDLE USE PINE, BASSWOOD, OR ANY OTHER AVAILABLE WOOD. CHISEL OUT DEPRESSION TO THICKNESS OF BLADE.
WIRING CONTINUED
BRASS FERRULE
TWO PIECES LIKE THIS: ONE IS RABBETTED TO RECEIVE THE BLADE; THE OTHER IS GLUED TO IT. THE HANDLE IS THEN WHITTLED TO PROPER SHAPE. WRAP THE HANDLE WITH COPPER WIRE, SOLDER AND FILE.
BRASS RIVET
KNIFE CUT FROM POWER HACK SAW BLADE OR OTHER SUITABLE MATERIAL
ANNUNCIATOR WIRE SOLDERED
BELT LOOP COPPER SCRAP
SHEATH MADE OF 4 PC. 1/4 X 1 7/8 X 10 WOOD

Hunting knife and sheath

Any softwood may be used for the handle. Be sure to form the rabbet tightly and use a brass rivet that fills the hole entirely to eliminate any possibility of play.

Most of the handle may then be wrapped with wire. After you start soldering, you may fill in the gaps with short pieces of wire and solder as you go.

Dip the handle in water from time to time as you solder. The wood will take up some of the water and this will keep it from burning.

After you have completely soldered the wire, file to the proper contour. Avoid filing too much. A little emery cloth will put the finishing touches on the handle.

When making the wood sheath, be sure that the hole for the handle is small enough. The knife handle should fit snugly in the hole — so snugly that the friction of wood on the handle will keep the knife in the sheath even when turned upside down.

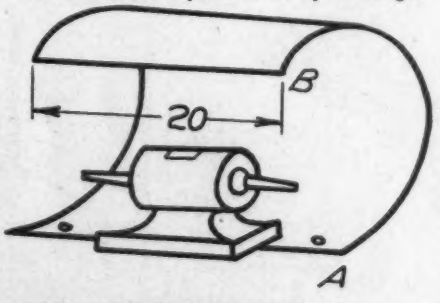
Soak the sheath in linseed oil before you put on the copper wire bands and belt loop. An additional wire band may be put on near the bottom of the sheath if so desired.

SPLASH HOOD FOR BUFFER

HENRY McCLELLAND
Buchtel High School
Akron, Ohio

The buffing hood, shown herewith, has proved quite satisfactory.

It is made of a piece of 20 by 24-in. galvanized iron run through the slip roller and fastened to the bench under the buffing motor.



Buffing splash hood

It is sufficiently large so that it never has to be detached when buffing large projects and still it provides a *backstop* which has prevented several small plastic articles from being broken when they slipped out of the hands of student buffers. It also keeps the dirt and muss of buffing localized.

ECONOMY DUSTPAN

GERALD A. BOATE
Seattle, Wash.

The dustpan herewith illustrated is a seventh-grade project. It is easily made, well proportioned, and so designed that twelve pans are cut from a 30 by 96-in. sheet of No. 22 standard gauge galvanized sheet steel. The cost to the boy for a dustpan, finished in any color high gloss quick-drying automobile enamel, using any color he may wish to have, is but nominal.

Construction: A smooth oak or maple block 1¼ by 7¾ by 9-in. is used as a form for bending, shaping, and soldering. How it is

used in shaping is shown in Figure 4.

1. Make a full-size paper pattern of the dustpan.

2. Cut out a piece of 22-ga. galvanized sheet steel 14 by 15 in. Spread library paste lightly on the edges of this sheet and mount the pattern smoothly on the metal so that the mouth of the pan will be the outside edge of the sheet because the galvanized coating on the sheet usually makes the edges thicker.

3. Cut out the blank very carefully, using straight blade tin snips, ½-in. cold chisel, and 8-oz. hammer.

4. Smooth up the edges with flat and triangular smooth-cut 8-in. files. If the metal sheet is placed between two hardwood blocks, so that the edges of the blocks are close to the edge to be filed, and the whole then clamped into a vise, both hands may be used while drawfiling, and the work will be less noisy.

5. Following the numbers shown in Figure 2, fold the blank to the required shape.

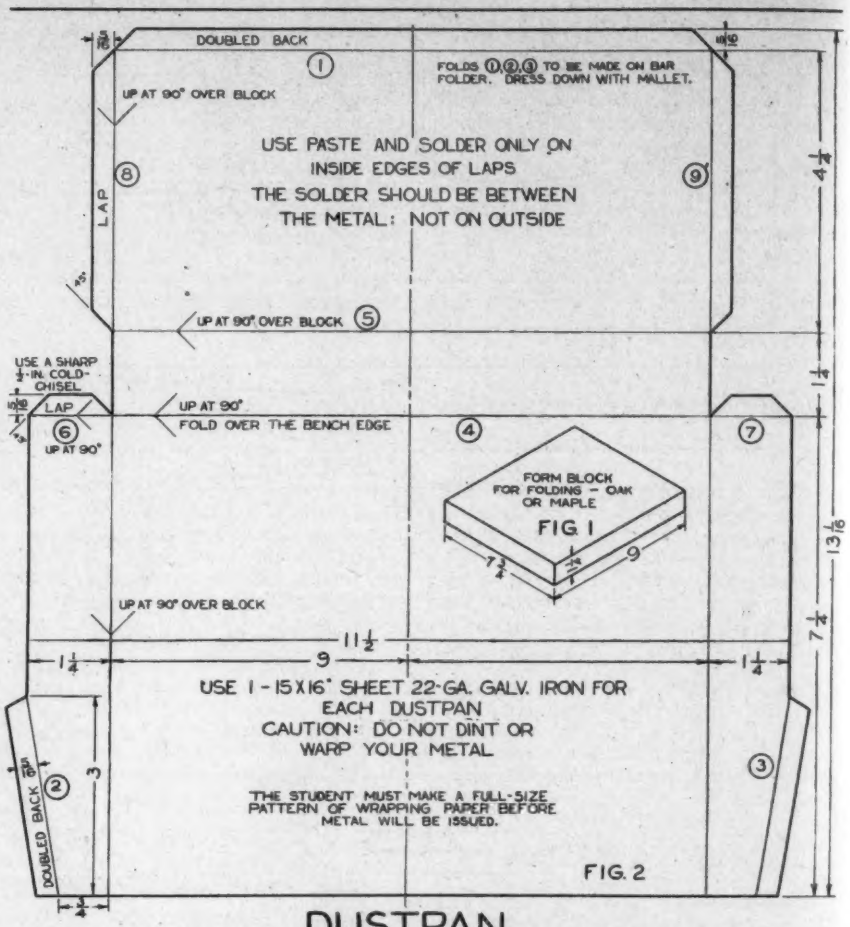
6. With the pan set up as shown in Figure 4, solder down the various laps. Do not clamp the metal too tightly as otherwise it may kink. There are really only two things to do in successful soldering:

a) Have everything clean that you are working with, including the tip of the soldering iron which should be filed with a fine file while piping hot — so hot that you can see the colors dancing on the copper (but never red-hot); also that the point of the iron is tinned.

b) Work slowly, remembering that it is heat and not pressure that does the job. Hold the soldering iron down on the metal and move it slowly along.

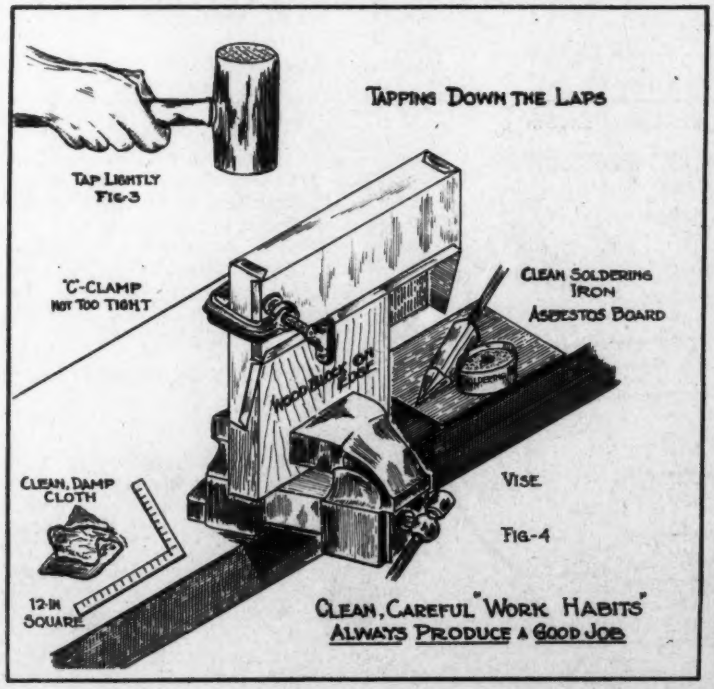
Tip the block in the vise to make it easier for the solder to flow downward under the joint. All finished joints must be smooth and look like any other part of the metal forming the pan.

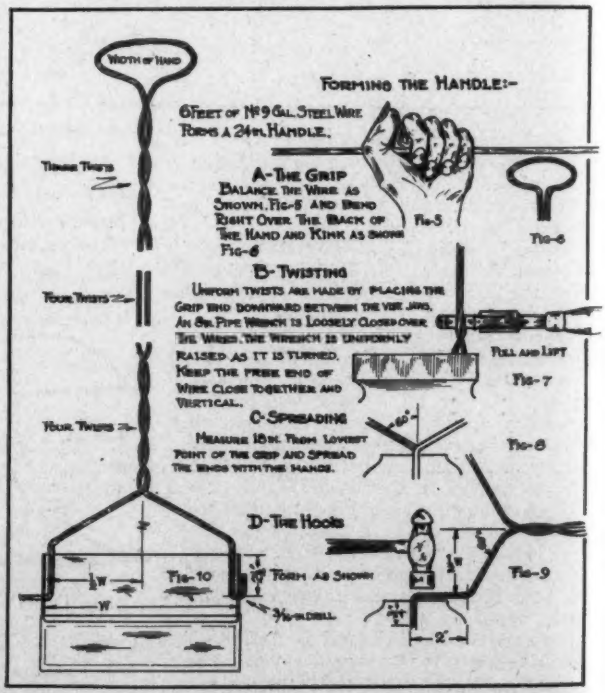
7. Polish the pan both inside and outside


DOUBLED BACK
FOLDS ①②③ TO BE MADE ON BAR FOLDER. DRESS DOWN WITH MALLET.
UP AT 90° OVER BLOCK
USE PASTE AND SOLDER ONLY ON INSIDE EDGES OF LAPS
THE SOLDER SHOULD BE BETWEEN THE METAL: NOT ON OUTSIDE
LAP
UP AT 90° OVER BLOCK ⑤
USE A SHARP ½-IN. COLD-CHISEL
LAP
UP AT 90°
FOLD OVER THE BENCH EDGE
UP AT 90°
FORM BLOCK FOR FOLDING — OAK OR MAPLE
FIG. 1
UP AT 90° OVER BLOCK
USE 1 - 15 X 16" SHEET 22-GA. GALV. IRON FOR EACH DUSTPAN
CAUTION: DO NOT DINT OR WARP YOUR METAL
THE STUDENT MUST MAKE A FULL-SIZE PATTERN OF WRAPPING PAPER BEFORE METAL WILL BE ISSUED.
DOUBLED BACK
FIG. 2

DUSTPAN

Layout of dustpan




WIDTH OF HAND
FORMING THE HANDLE:-
6 FEET OF № 9 GAL. STEEL WIRE FORMS A 24 IN. HANDLE.
THREE TWISTS
A-THE GRIP
BALANCE THE WIRE AS SHOWN. FIG-5 AND BEND RIGHT OVER THE BACK OF THE HAND AND KINK AS SHOWN FIG-6
FIG-5
FIG-6
FOUR TWISTS
B-TWISTING
UNIFORM TWISTS ARE MADE BY PLACING THE GRIP END DOWNWARD BETWEEN THE VISE JAWS. AN 8 IN. PIPE WRENCH IS LOOSELY CLOSED OVER THE WIRES. THE WRENCH IS UNIFORMLY RAISED AS IT IS TURNED. KEEP THE FREE END OF WIRE CLOSE TOGETHER AND VERTICAL.
FULL AND LEFT
FIG-7
FOUR TWISTS
C-SPREADING
MEASURE 18 IN. FROM LOWEST POINT OF THE GRIP AND SPREAD THE ENDS WITH THE HANDS.
60°
FIG-8
D-THE HOOKS
FIG-10
FORM AS SHOWN
FIG-9

Method of bending blank to form dustpan, and forming wire handle

with No. 100 Metalite cloth, until the surface is shiny. The permanency and beauty of your paint job depends largely on this operation. *Enamel will not stick to a dirty surface.*

8. Form the handle. See Figures 5, 6, 7, 8, and 9.

9. Centerpunch and drill the holes for the wire, insert the handle, and bend up the ends of the wire as shown in Figure 10.

10. Begin painting on the inside of the dust pocket, then the ends, top, handle, and bottom, leaving the grip until last. Use a wire hook for holding the handle while it is being painted, and also to hang the pan up to dry.

Our records show that the average time required by a seventh-grade boy to finish this project is eight hours. Eight hours of enjoyable work at a cost of 25 to 50 cents is quite economical and thrifty, especially when at the end he has something that is worth three times what it cost him.

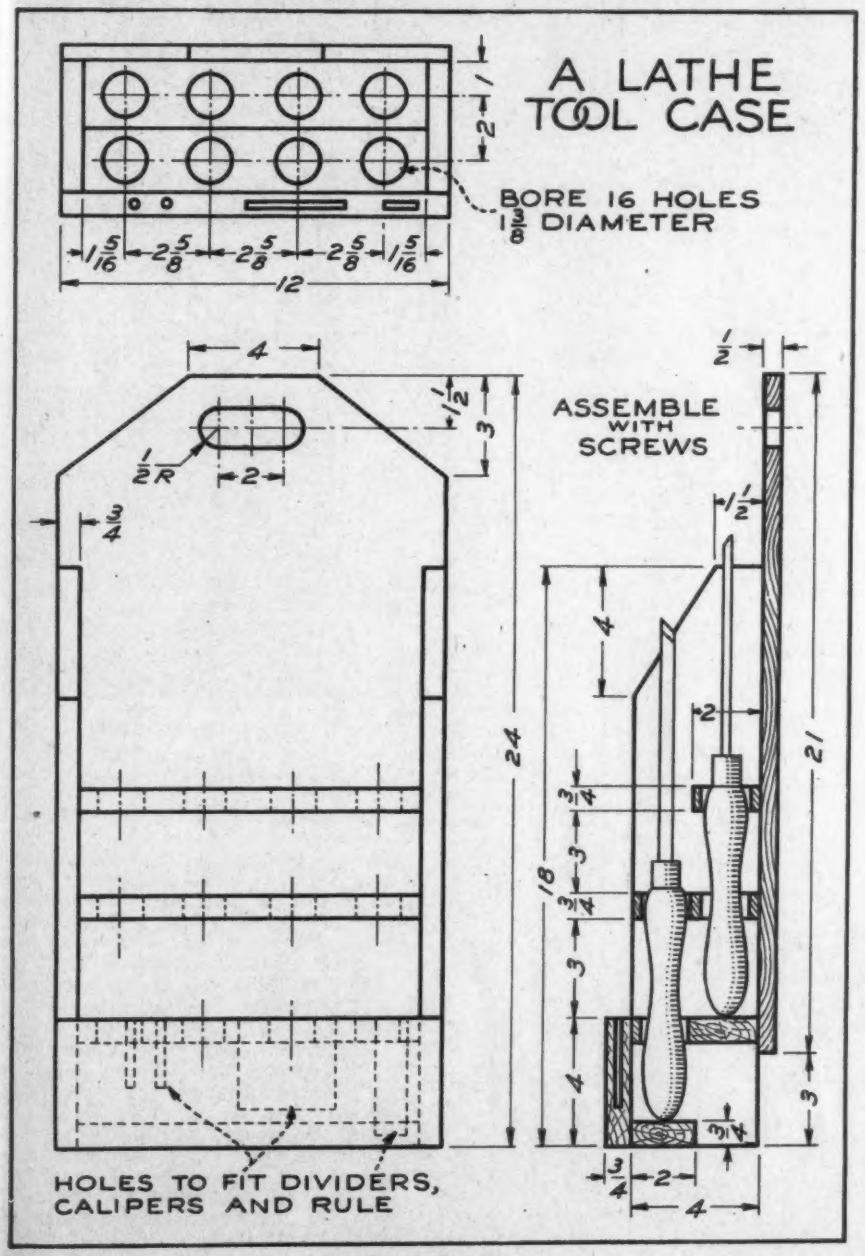
PORTABLE LATHE TOOLHOLDER

M. E. WARNER
Wilson High School
Cedar Rapids, Iowa

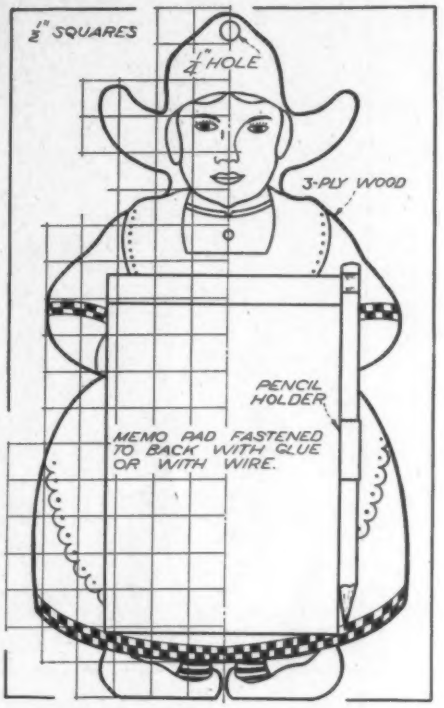
The lathe toolholder illustrated and described herein has been in use in the Wilson High School shop for the past four years. It is very compact and may be set inside of a larger tool case for storage if desired. The holes through the shelves should be bored about ⅛ in. larger than the diameter of the tool handles. It may be necessary to change the spacing of the shelves for tools with longer or shorter handles. The back is left open at the bottom to prevent shavings from accumulating inside.

The drawing shows provision for pockets for calipers, dividers, and a rule. Dimensions for the pockets were purposely omitted on the working drawing because of the difference in size and design in which such tools may be obtained.

With this holder, the desired lathe tool is easily selected. Three such holders are in use in the shop, and in four years no tools have been lost. If made of durable wood, assembled with screws, and painted, they should last indefinitely.



Lathe toolholder



Dutch girl memo pad, made of ¼-in. plywood and painted to suit personal preference. Submitted by Cecil Ford, Prin., Public School, Delmar, Dela.

MOTOR DRIVE FOR SHAPER

C. W. ILLINGWORTH
Supervisor
Trade and Industry Department
Racine Vocational School
Racine, Wis.

The problem of providing direct motor drives to shapers has been solved with a design involving the use of a hinged base for the motor, double V belts, and an automobile driving transmission. The elimination of overhead shafting by providing this type of direct drive may be done at reasonable cost, yet the work of building this attachment is not difficult and is well within the ability of most school shops. The whole arrangement is very neat, compact, and handy.

In making up a motor drive design such as this, the first essential is that it be practical and capable of working continuously without breakdown. It ought also to be neat looking with none of the amateurishness often found in makeshift attachments. The illustrations show the two types of motor

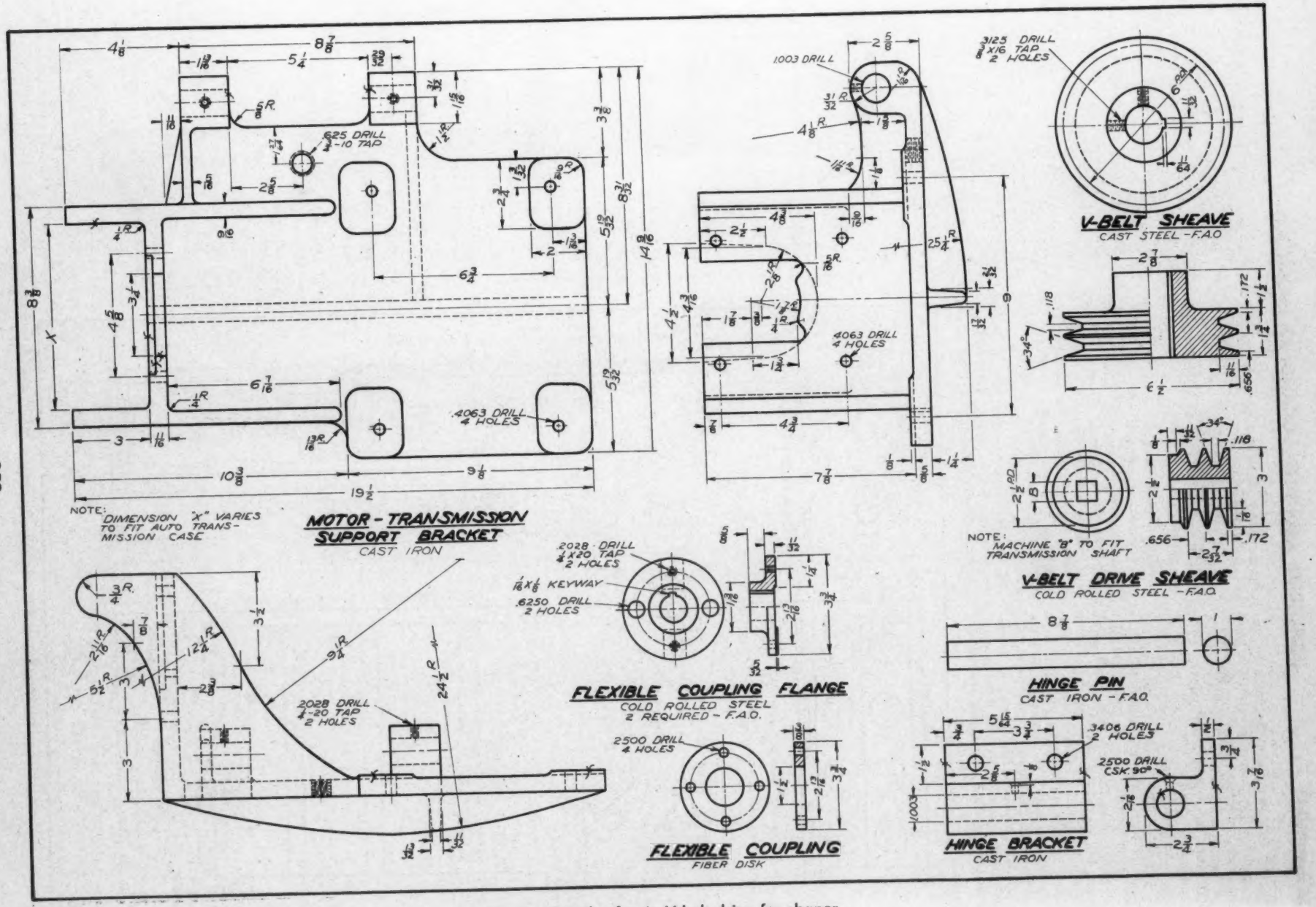

MOTOR - TRANSMISSION SUPPORT BRACKET
CAST IRON
NOTE: DIMENSION "X" VARIES TO FIT AUTO TRANSMISSION CASE
.625 DRILL 5/8-10 TAP
4063 DRILL 4 HOLES
1003 DRILL
3125 DRILL 5/16 X 16 TAP 2 HOLES
V-BELT SHEAVE
CAST STEEL - F.A.O.
V-BELT DRIVE SHEAVE
COLD ROLLED STEEL - F.A.O.
NOTE: MACHINE "B" TO FIT TRANSMISSION SHAFT
.2028 DRILL 1/4 X 20 TAP 2 HOLES
1/16 X 1/8 KEYWAY
.6250 DRILL 2 HOLES
FLEXIBLE COUPLING FLANGE
COLD ROLLED STEEL 2 REQUIRED - F.A.O.
2028 DRILL 1/4-20 TAP 2 HOLES
2500 DRILL 4 HOLES
FLEXIBLE COUPLING
FIBER DISK
HINGE PIN
CAST IRON - F.A.O.
3406 DRILL 2 HOLES
2500 DRILL CSK. 90°
HINGE BRACKET
CAST IRON

Fig. 3. Details of twin V-belt drive for shaper

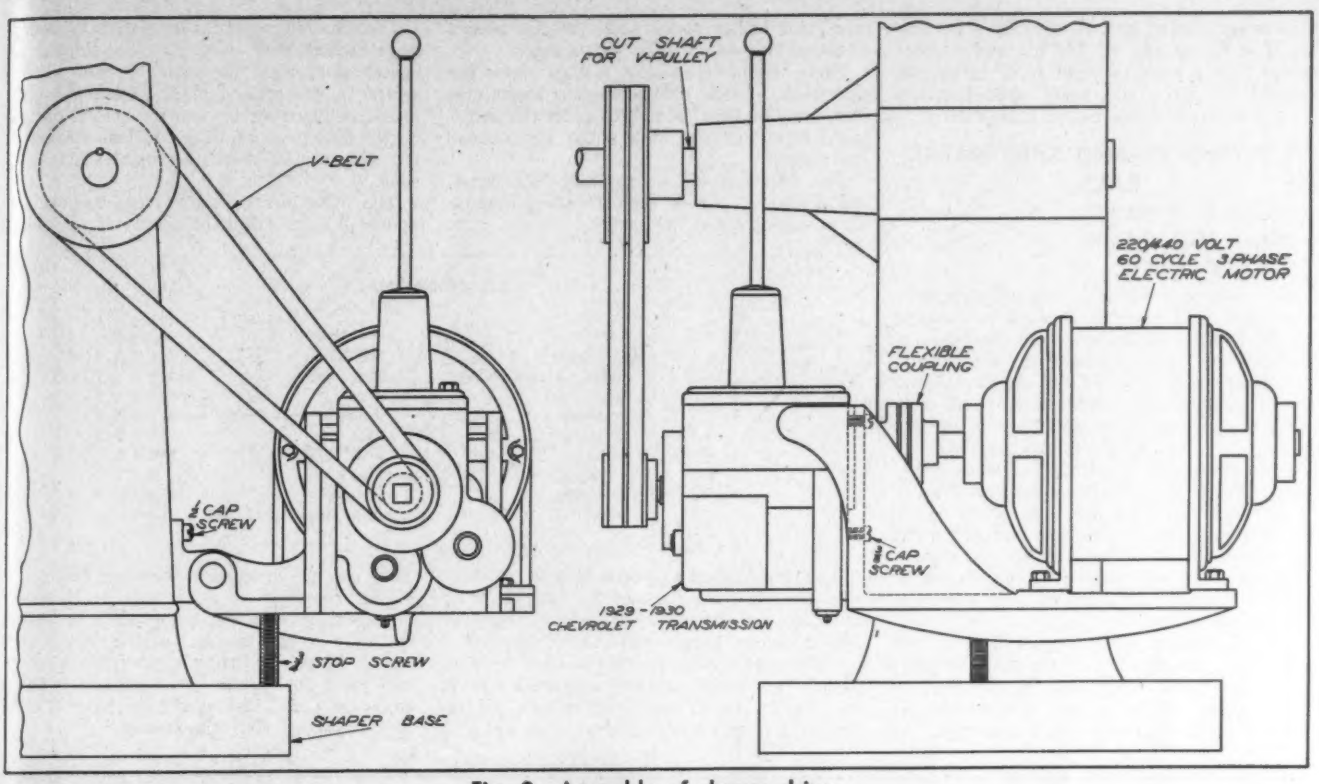


Fig. 2. Assembly of shaper drive

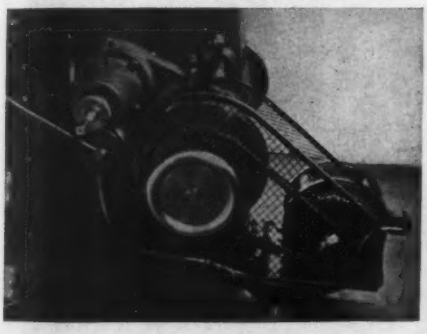


Fig. 1. Twin V-belt shaper drive

drives for shapers built at the Racine Vocational School. Figure 1 shows the first attempt. This involves a motor hanging in the rear of the shaper, on a hinged base, driving through twin V belts, and operating on 2-step pulleys. This provides four different speeds for the shaper, since there are two in the machine itself. With this design, it is necessary, in changing speeds, to shift the V belts. With the guard placed over the drive there is some difficulty in shifting the belts.

The newest attachment designed is illustrated in Figures 2 and 3. This has proved much more efficient, is easy to change speeds, and provides a greater range of speeds.

The same type hinged base hung at the rear, carrying a motor, is also used. The design shows an automobile transmission bolted to the motor bracket and connected to the motor by a flexible coupling. The flexible coupling was used so that any slight misalignment of the motor would not affect the smooth running of the shafts. The base on which the motor is mounted should be machined to provide as accurate an alignment as possible, but even with the greatest care there would likely be some vibration and strain without a flexible coupling.

At the other end of the transmission is mounted a double *V* belt pulley and one on the main shaft of the shaper. Since flat belt drive shapers to be motorized in this manner have a rather long shaft extending out from the main body of the machine to carry the cone pulley, it is advisable to cut the shaft on the outside of the position in which the new pulley is placed. On this shaft should also be placed a handwheel for manual operation.

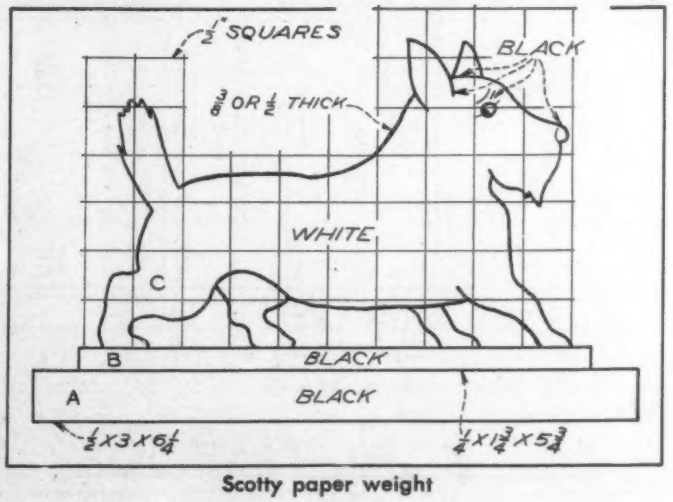
This design provides eight speeds, four in the transmission and 2 in the shaper. Belts remain permanently in place and can be covered by a neat looking guard. It has been found that a 1½ h.p., 3-phase, 60-cycle motor is adequate for the 14, 16, or 18-in. shaper used in a school shop.

It will be noted that the gear shift lever on the machine has been cut down to make a neat looking arrangement. Any speed desired can readily be obtained by a simple shift of the levers. Proper tension on the V belts is obtained by an adjusting screw under the main hinged bracket.

SCOTTY PAPER WEIGHT

CECIL FORD, PRIN.
Public School
Delmar, Del.

This paper weight may be easily copied to any size and made from scrap wood. It makes



Scotty paper weight

a pleasing prize or gift. A is ½ by 3 by 6¼ in., B is ¼ by 1¾ by 5¼ in., and C may be cut from a piece of wood ⅜ or ½ by 3¼ by 5¼ in. Black and white enamel makes a very effective finish for this project.

A PLYWOOD AND SHEETMETAL RACK

HAROLD L. FORSEA
Union High School
Corning, Calif.

In most general shops all available floor space and wall space is devoted to carrying on the various experience areas, and storage facilities are at a premium or even lacking.

Separate storage racks for sheetmetal and for plywood can be combined into one rack, using the wall space for the plywood, and the outer space for the sheetmetal, as shown in the accompanying illustration. The plywood compartment accommodates standard 4 by 8-ft. plywood sheets on edge. The height of the front compartment is built to suit the width of sheetmetal as commonly used in a given shop. A sheet of metal or plywood can be readily selected and removed over the front or through an end.

If only narrow sheets of metal are stored, i.e., 24-in., the plywood can be lifted as easily from the front. This obviates the need of keeping the ends clear, and at least one end may be placed against another cabinet. An extra two inches or so added to the length of the rack is advisable in such a case.

There should be separate storage places for the small pieces. For example, sheetmetal scrap may be kept on a shelf under the sheetmetal layout bench, or in a box placed near the shears.

The following bill of material lists standard stock for a rack built to the minimum dimensions given in the plan:

The sheathing material suggested is dressed-and-matched pine, but may be shiplap or lighter stock. One precaution should be observed in the general plan. Fasten the floor pieces in place on the nailers before putting on the first piece of D. & M. This eliminates any cracks into which the metal sheets may slide.

The filler pieces in the front against the floor will come from the scraps of sheathing.

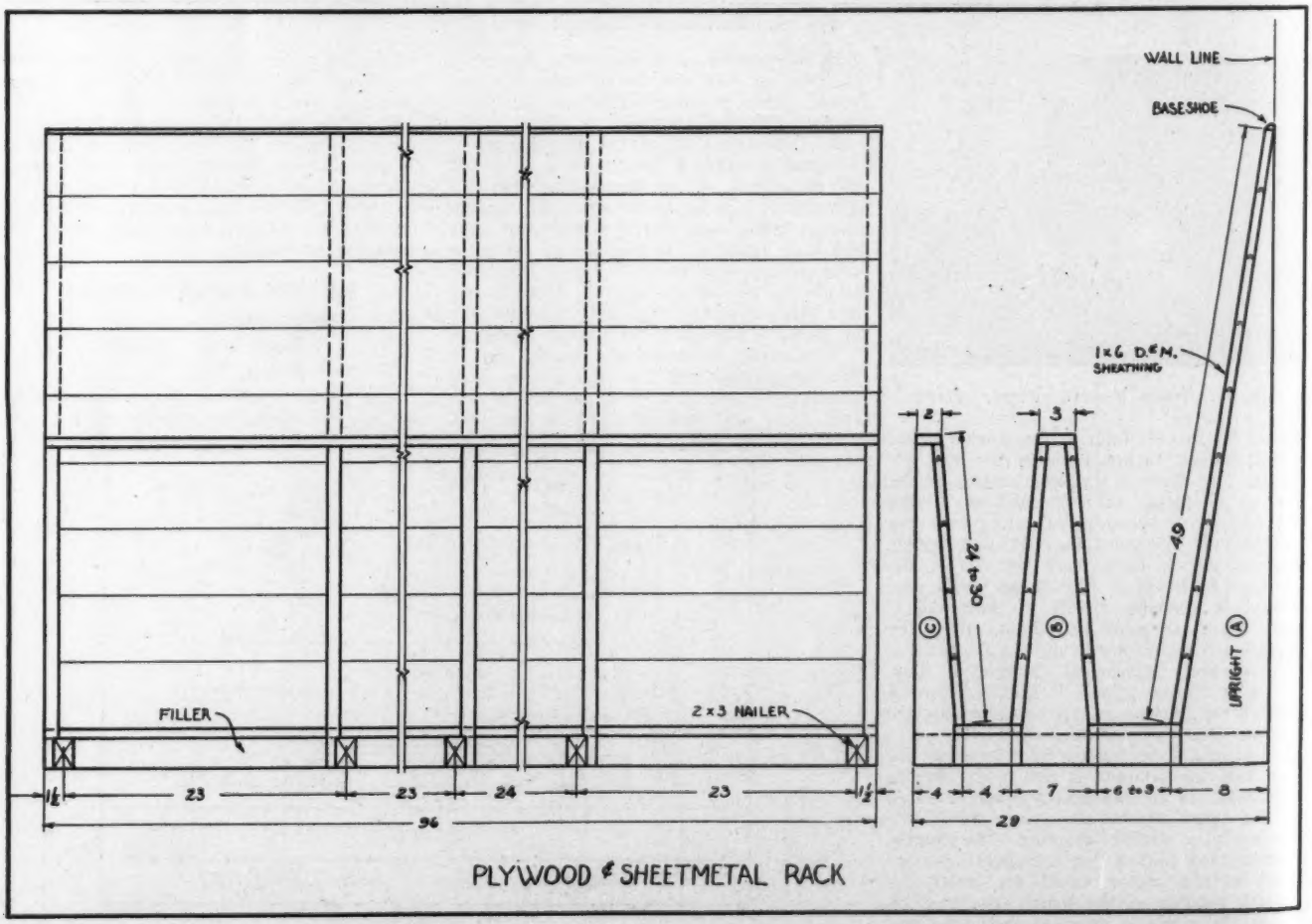
BILL OF MATERIAL

No. of Pcs.	*Name*	*Material*	*Size*
1	Base nailers	Fir, S4S	2 x 3 x 12
2	Uprights (A) and (C)	Pine, S4S	5/4 x 8 x 10
1	Uprights (B)	Pine	5/4 x 6 x 12
1	Floor pieces	Pine	1 x 8 x 8
1	Floor pieces	Pine	1 x 6 x 8
12	Sheathing	D & M pine	1 x 6 x 16
1	Top trim pieces	Pine	1 x 6 x 8
4	Filler pieces	Scrap	1 x 3 x 2
1	Molding	Base shoe	8 lin. ft.

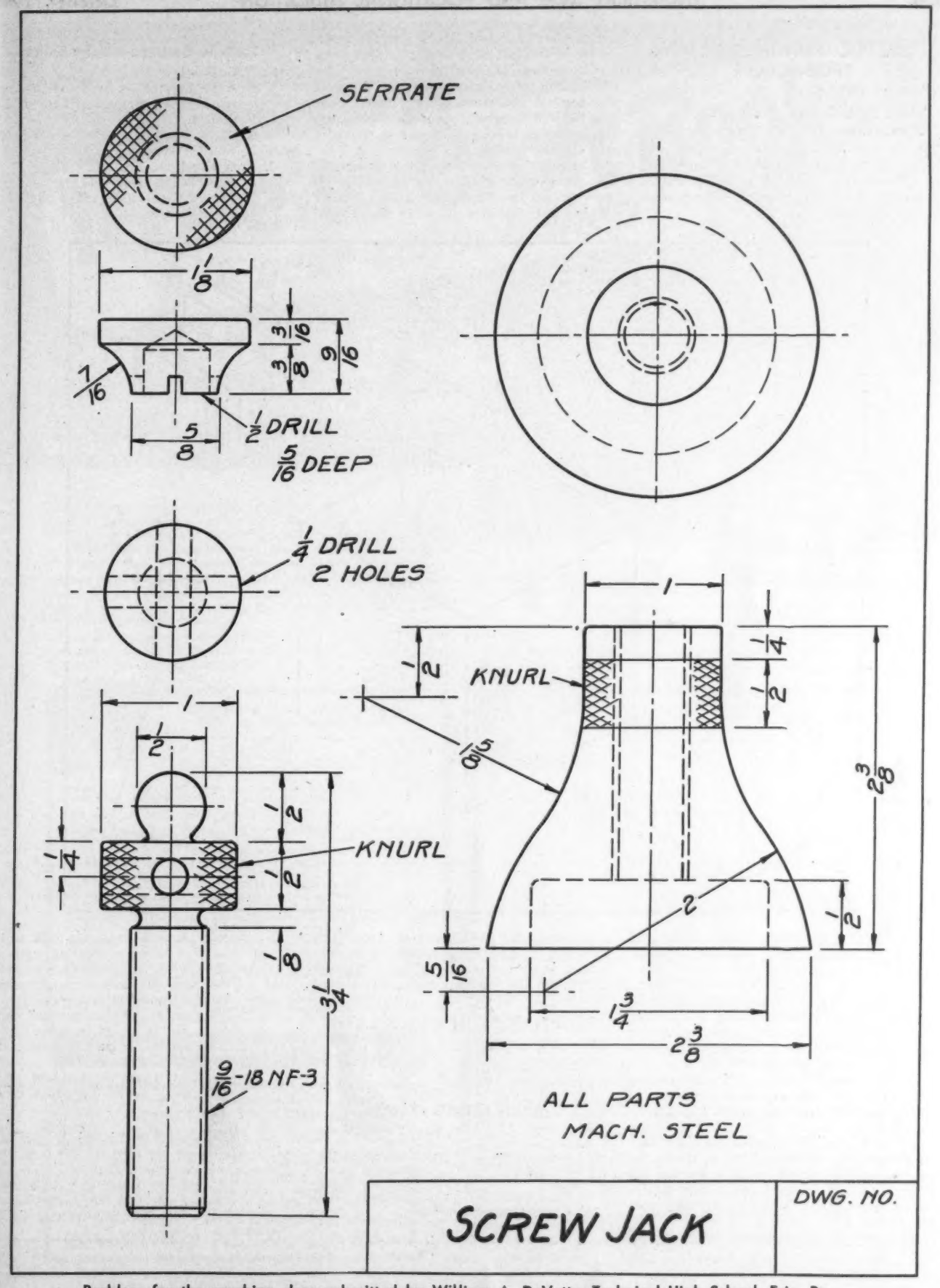
The single-tapered uprights can be cut more economically from the 5/4 by 8-in. stock by alternating them when laying out. This, of course, is not true of the center section of uprights which will cut from the 5/4 by 6-in. piece. The lower ends are rabbeted out ⅜ by 2⅝ in. to fit over the nailers for increased strength in the joints.

They are put in to make cleaning easier.

The construction need not be elaborate. However, if sufficient plywood is available, this may be used in place of the dressed-and-matched pine. By casing in the front, also, the rack will look more finished and will be easier to clean, and in general have a much more workman-like appearance.



PLYWOOD & SHEETMETAL RACK

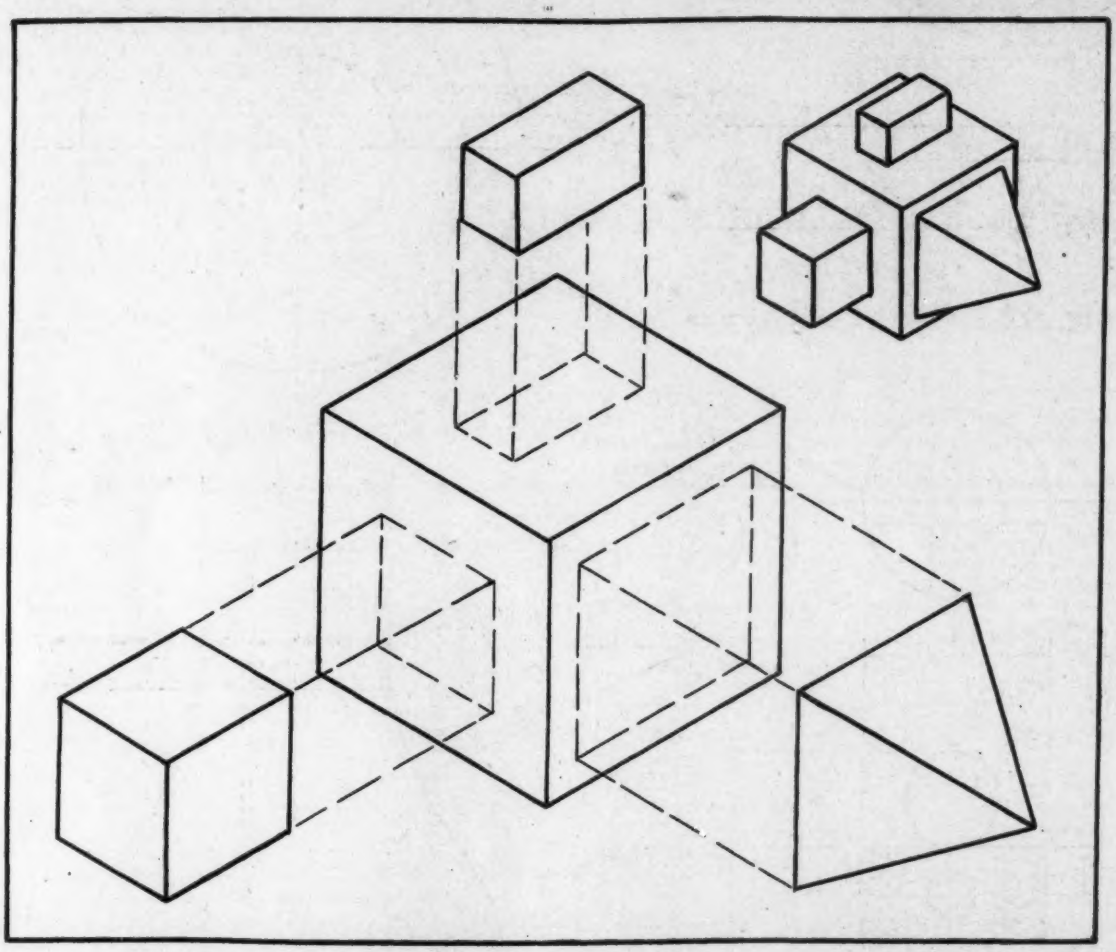


Problem for the machine shop submitted by William A. DeVette, Technical High School, Erie, Pa.

ISOMETRIC DRAWINGS IN WAR PRODUCTION

GODFREY THEISS
Wells High School
Chicago, Ill.

In our war factories, production and more production is the vital need if victory is to be achieved. The plans of an article change frequently and new production demands must be met constantly.



Therefore, a company or firm engaged in war work cannot waste valuable time in explaining to its workers the plans of some one article, nor can the warworker himself spend a large part of his time trying to visualize the object. There is always the danger that this enforced haste will result in inferior workmanship. For this reason isometric drawings are virtually indispensable.

In an isometric drawing the worker can readily visualize the object and almost instantly put the scattered pieces together to complete the desired form. They also are easily understood because of the fact that all three views of the object are shown. In an orthographic projection of a drawing the three views are scattered and it may take a worker much time in visualizing the completed object.

The isometric drawing is a timesaver. As skilled labor is limited this is a factor which cannot be overlooked. A worker without practice in reading blueprints can get along very well reading isometric drawings. But a person who has not had much practice and experience with orthographic projection drawings will encounter serious difficulties in trying to read them.

A study of the accompanying illustration will prove more readily the usefulness of isometric drawings and the reason for their use by war factories all over the United States producing goods necessary for victory. Isometric drawings are important in war production today and will be of much more importance in the coming months.

TECHNIQUES IN USING LATHE

JOHN MC INNES
Public Schools
Montesano, Wash.

Names of Parts of Lathe

1. Headstock
   - *a*) Live center
   - *b*) Cone pulley
   - *c*) Faceplate
2. Tailstock
   - *a*) Dead center
   - *b*) Center clamp
   - *c*) Center adjusting screw
   - *d*) Adjusting clamp
3. Tool rest
   - *a*) Tool-rest height clamp
   - *b*) Tool-rest clamp
   - *c*) Tool rests
4. Bed
   - *a*) Ways
   - *b*) Legs or bench

Tools to Be Used on the Lathe

1. Parting tool
   - *a*) A parting tool is used to cut stock to diameter, preparatory to cutting pattern.
   - b) It is used to cut off work when finished.
2. Skew chisel
   - *a*) Face side down on tool rest, this tool is used for scraping round objects to desired shape.
   - *b*) Edge down on tool rest, this tool is used in making shearing cuts for finish work. In using with edge down, the body of the tool should always be kept behind the cutting edge.
   - *c*) Skew chisels come in several widths — ½ in., ⅝ in., ¾ in., etc .
   - *d*) The heavier the cut to be taken, the larger the chisel should be.
   - *e*) For best results the tool rest should be slightly above the center of the work.
3. Gouge
   - *a*) Gouges are used in spindle turning.
   - *b*) Gouges are used for the initial cuts on the square stock.
   - *c*) In use, the gouge should be turned on its side and fed slowly into the work, starting with square or less

(Continued on page 22A)

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Circular Saw and Jointer — Complete information on construction and use of 10" Tilting Arbor Saw and 6" Jointer. Includes: Ripping; Saw Projection; Use of Moulding Fence; Cross-cutting; Miters; Cutting to Length; dozens of other subjects.

Shaper — Adjustments; Cutters and Collars; Shaping with Guides, with Collars, with Patterns; Forms, Jigs, Fixtures; etc.

Band Saw and Scroll Saw — Complete data on Band Saw Blades; Ripping and re-sawing; Use of Standard Fence; the Ripping Blade; Ripping Curves; Tilt Table; many other subjects.

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TECHNIQUES IN USING LATHE

(Continued from page 356)

rounded part of the work and going toward the round.

d) Each time, the person using this tool should start about an inch out in the rough part of the work and cut to the finished part of the job. This technique will prevent the cutting out of deep splinters.
e) The gouge should not be used for finish work in faceplate turning.
f) Gouges come in several widths—½ in., ⅝ in., ¾ in., and larger.

4. Square chisel
   a) Square chisels come in a variety of widths as do the other chisels.
   b) A square chisel is used similarly to a skew chisel on spindle turning.
   c) It is used in faceplate work.
      (1) Makes straight cuts in faceplate work.
      (2) A scraping technique is used.
5. Roundnose chisel.
   a) The roundnose chisel comes in a variety of widths as do the other chisels.
   b) A scraping technique is used with this chisel in spindle turning to make inside curves.
   c) A scraping technique is used with this chisel in faceplate work.
   d) This chisel is used for all curved cuts found in faceplate work.

The Use of the Tool Rest

1. Cuts should never run nearer than ½ in. of end of the tool rest.
2. If possible, the tool rest should never be more than ¼ in. away from the work.
3. The tool should be held on rest with handle below and behind cutting edge.
4. Height of rest should be adjusted to put cutting edge just above center of work.

Centering Stock for Spindle Turning

1. Round stock
   a) Use morphidite caliper to determine center.
   b) On end to go into live center, two saw cuts about ⅛ in. deep should be made at right angles across the end.
   c) With ⅛-in. drill, drill a hole about 3/16 in. deep in center of end.
   d) On end for tailstock, drill the hole in center, as directed for other end. No saw cuts will be necessary.
2. Square stock
   a) Determine centers of stock by use of diagonals.
   b) Make the perpendicular saw cuts and drill holes as directed in centering round stock.
   c) Special notes.
      (1) If stock is to be removed from lathe before job is finished, some system of marking should be used so stock will be returned to live center the same each time.
      (2) A little bit of cup grease placed on dead center before putting stock in the lathe to be turned will prevent an annoying squeak that would otherwise develop if the work were to run dry.

Fastening Stock on Faceplate

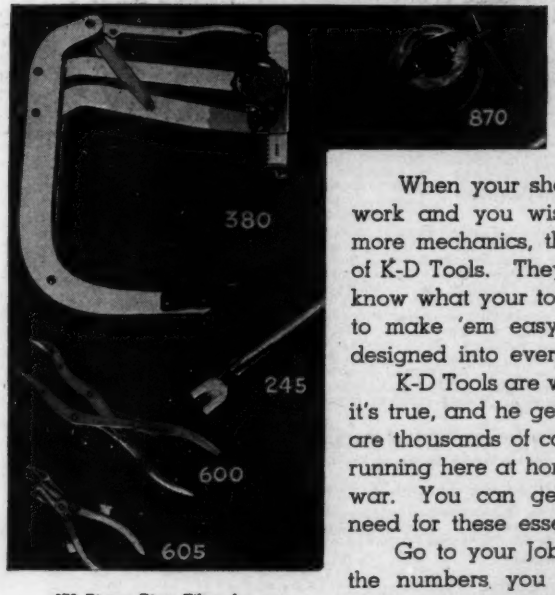
1. Care should be taken that sufficient stock is left to prevent cutting through into screws from back of faceplate.
2. A piece of waste stock can be glued to back of stock to be used for fastening to faceplate. Glue a piece of paper between the waste stock and the work, so as to make the work of splitting off the waste easier.
3. It is advisable to cut off the corners with band saw or handsaw before putting the work in the lathe.

Use of Calipers

1. Outside calipers
   a) Set caliper for desired diameter.
   b) When work has been turned almost to desired diameter, hold calipers in left hand so they will run lightly on revolving stock. Take care not to force the calipers over stock or to wear a groove in stock with them. Use the right hand to hold the chisel to make the finish cuts that will bring the work to the desired diameter.
   c) Care should be taken to leave sufficient material to smooth the job to finish diameter.
2. Inside calipers.
   a) Stop work when using.
   b) Set calipers for desired diameter and insert in hole to be measured.

A Sign of the Times

THAT POINTS TO K-D



870 Piston Ring Filer, for correctly filing rings to proper fit. 380 Valve Spring Compressor for all valve-in-heads and most L-heads. 600 a versatile and popular Valve Spring Lifter for L-head motors. 605 Keeper Inserter installs split keepers. 245 Bar-type Valve Lifter for Fords. These are only a few of nearly 60 speedy K-D Tools.

When your shop is "swamped" with work and you wish you had a couple more mechanics, that's the time to think of K-D Tools. They're built by men who know what your tough jobs are and how to make 'em easy. They've got speed designed into every rivet of 'em.

K-D Tools are working for Uncle Sam, it's true, and he gets first call. But there are thousands of cars and trucks to keep running here at home if we're to win this war. You can get the K-D Tools you need for these essential repairs.

Go to your Jobber, he probably has the numbers you need, right there in stock or can get them for you. Write to us for a complete catalog, if you don't have one: K-D Manufacturing Co., Lancaster, Pa., or Hamilton, Ontario.

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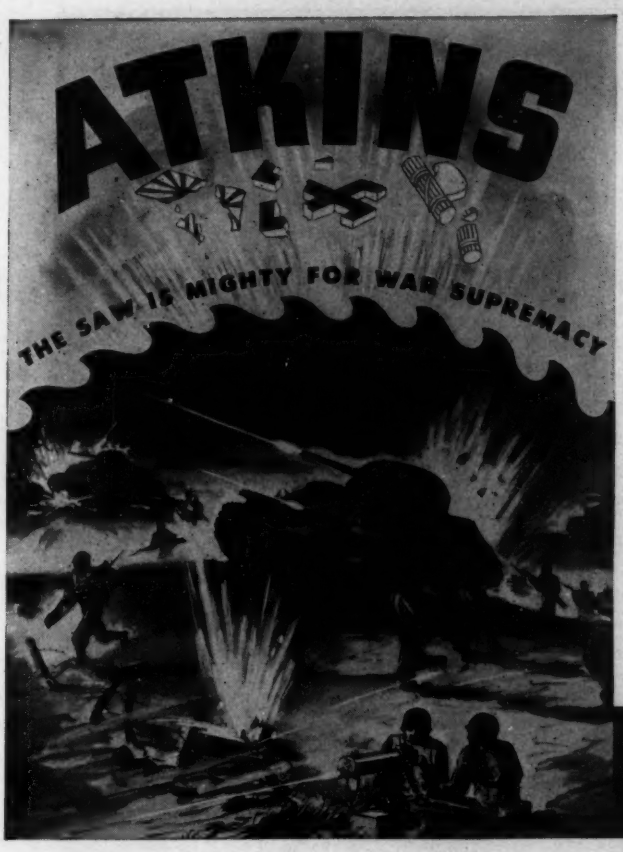

● E. C. Atkins and Company has been entrusted with the responsibilty of keeping saws cutting tirelessly in thousands of plants. For, in this war, the saw which cuts the numberless parts which go into mechanized armaments is a tool of paramount importance. Every weapon, machine or instrument of war begins with a cutting stroke.

We are proud to report the use of Atkins Saws in many new plants cutting new materials, with the success to be expected of 86 years of experience. Combined with experience are numerous practical demonstrations by Atkins engineers—all with a view to getting the right tool on every specific cutting job.

In the metal cutting field, saws of the "Curled-Chip" design have set new high standards of metal cutting saw performance. Atkins Engineering extends to other fields—to the timber industry with equipment like the new Electric Tree Faller—to supplying saws for technical units ashore, afloat and aloft.

Thus is Atkins' all-out production meeting the demands of all-out war.

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Cutting a Name for Themselves
IN EVERY PHASE OF WAR PRODUCTION!

Personal News

♦ Dr. William E. Warner, professor of education, Ohio State University, Columbus, Ohio, has been on leave since March in order to serve first as Consultant and currently as Principal Civilian Protection Officer, United States Office of Civilian Defense, Washington 25, D. C. His work has concerned the organization and development of materials for the protection of American industry in the event of enemy action.

♦ Dr. John E. Crawford was granted a leave of absence from the Pittsburgh, Pa., schools, to become officially a staff member of the Personnel Planning and Research Department, RCA Victor Division of Radio Corporation of America at Camden, N. J. Dr. Crawford's new duties bring him close to the war-production line, and include course planning and some teacher training.

♦ Harvey W. Waffle, formerly teacher of mechanical and machine drawing at the Senior High School, Waukesha, Wis., has recently been appointed instructor of architectural and machine drawing at the Senior High School, Davenport, Iowa.

♦ Wayne Adams, on leave from his position as Associate Professor of Industrial Education at the North Texas State Teachers College, Denton, Tex., recently joined the staff of the Teacher Training Department, at the Armored Force School, Fort Knox, Ky. Mr. Adams replaces Mr. Roy E. Howard, who accepted a position with General Motors Corporation in Flint, Mich.

♦ Walter Nalbach, on leave from the Industrial Education Department of the Western Kentucky State Teachers College at Bowling Green, Ky., has recently joined the staff of the Teacher Training Department, The Armored Force School, Fort Knox, Ky.

♦ Harold E. Shaffer, an instructor in mechanical drawing at the Boys' Trade and Technical High School, Milwaukee, Wis., for more than 25 years, died August 4 in Mount Sinai Hospital.

Born in Scranton, Pa., he came to Milwaukee 32 years ago. He was a graduate of Colorado State Teachers College. Mr. Shaffer is survived by his wife, Rose, and two sons, Kenneth H. and Russell, a second class petty officer in the navy, stationed at Jacksonville, Fla.

The funeral services were held on Saturday, August 7.

♦ Maynard Matteson, a member of the faculty at Boys Technical High School, Milwaukee, Wis., for more than 15 years, died on August 10 at his summer home near Medford.

Mr. Matteson spent his boyhood in northern Wisconsin near Unity. One of the first expert welders in the state, he learned his trade by working in a plant in Indiana. He returned to northern Wisconsin and operated a welding and repair shop. He also installed, operated and maintained a local telephone system in that section.

Later he came to Milwaukee and worked for an automobile firm, taught at both the Vocational School and the Milwaukee Motor School before he went to the high school. He was an instructor in welding and automotive work at Boys Technical High School.

Mr. Matteson is survived by his wife and son, Jesse F. Matteson, Milwaukee.

Questions and Answers

A PENETRATING WOOD FINISH

1101. Q.: On page 123 of your very informative *Wood Finishing and Painting Made Easy* you speak of a wood preservative finish which was outstanding in comparison to nine other finishes so tested.

I would like very much to use this finish on certain work in place of the old oil finish and would greatly appreciate it if you would furnish me with the name and, if necessary, the address, of the maker.—*W. N. G.*

A.: The finishing material listed on page 123 of my book, *Wood Finishing and Painting Made Easy*, is made by Du Pont, under the trade name, "Du Pont Penetrating Wood Finish," and is sold in quarts and gallons. It has been modified again this year to keep up with available materials; hence your correspondent will be wise to follow to the letter the directions given on the label.—*Ralph G. Waring.*

TOASTED FINISH ON MAPLE

1102. Q.: Can you tell me how to put a toasted finish on maple furniture.—*M. E. B.*

A.: I have written to the secretary of The Furniture Mart, and to four plants on my list of furniture manufacturers. The finish under this name is unknown to all of us and is apparently a local sales terminology. As it is written, it is without meaning.—*Ralph G. Waring.*

FINISHING A PIANO

1103. Q.: I have a piano upon which the finish has become badly cracked. I understand that there is a product on the market which can be used as a solvent which enables the user to flow the old finish into these cracks thus smoothing the finish without removing the old.

Will you kindly inform me as to the name of the product described above.—*G. E. G.*

A.: In regard to the solvent for a badly cracked piano finish. There is absolutely nothing that can be done with this finish except to strip the case and entirely refinish, a matter which can only be done by a really good piano finisher.

(Continued on page 26A)

It's New... Logan

QUICK CHANGE GEAR LATHE

Precision Built FOR SUSTAINED ACCURACY

The variety of work it handles... the speed, accuracy, and safety of its operation place this new lathe in a class by itself. It combines compactness, economy and versatility. With its friction feed automatic apron and precise construction throughout, this new Logan Quick Change Gear Lathe is by every standard a rugged, highly adaptable machine of sustained accuracy. Bed ways, for example, are precision ground to within .001" of absolute accuracy. Total run out of the headstock spindle 12 inches from the bearing is less than .001". The lead screw is held to within .002" in 12 inches. All moving parts are protected by ball bearings or by self-lubricating bronze bearings. As for economy, the new Logan No. 820 quickly pays for itself through lowered unit costs.

LOGAN ENGINEERING COMPANY · Chicago, Illinois

Brief Facts

- Swing over bed 10½"
- Bed length 43⅛"
- Spindle hole 25/32"
- Precision ground ways: 2 prismatic "V" ways; 2 flat ways
- 12 spindle speeds—30 to 1450 per minute
- Worm drive from lead screw spindle for power feeds
- Friction clutch on power feeds
- Longitudinal feed .0015 to .1000" per spindle revolution
- Cross feed .25 times longitudinal feed
- Half nut drive from lead screw thread for thread cutting

Threads—48 selections RH or LH—4 to 224 per inch

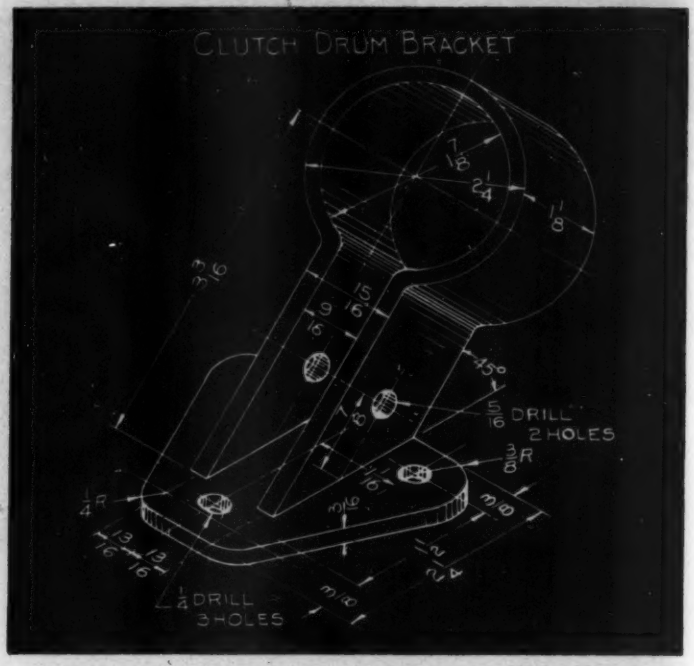
Logan

A NAME TO REMEMBER WHEN YOU THINK OF LATHES

Are you stuck for a stickler?

Here's a challenging new classroom problem to give to your embryo draftsmen. Ask them to draw the correct orthographic views of this clutch drum bracket.

Among the professional tools easily available to students are *Typhonite* ELDORADO pencils. It's a real incentive to work when a *Typhonite* ELDORADO is at hand. Clean, clear, positive lines. No feather edges to mar the accuracy of a blueprint. Specify *Typhonite* ELDORADOS on your next assignment and see what an improvement they make in students' technique.



SOLUTION: We'll send you a free blueprint showing this problem's solution if you write to the address below within 30 days. Specify Blueprint No. 128-J10.

TYPHONITE
ELDORADO

School Bureau, Pencil Sales Dept.
Joseph Dixon Crucible Company, Jersey City, N. J.

(Continued rom page 24A)

Someone with an extended experience at home in really good furniture finishing in varnish might attempt this with entire satisfaction, but not otherwise. It would entail not only good equipment and good mechanical ability, but most important of all, a clean, dust-free space with good light and heat. One or any of these factors missing would easily ruin the entire job.

The so-called solvents for this old finish under the term of "rejuvenators" is not only misleading, but downright dishonest. I have seen one or two of these restored jobs done by men of long experience and while the finish looked fairly well for a week or two, as soon the winter furnace heat came on, the old checks appeared as bad as before the treatment. — *Ralph G. Waring.*

News Notes

♦ "Fairchild PT–19 Trainer" is the title of a new three-reel, color film now available for use through The Princeton Film Center, Princeton, N. J.

Produced primarily for use in preflight aviation, the picture shows the need for, and value of, a training airplane with the flying characteristics of the tactical aircraft, that student pilots will fly after induction into the air forces.

Technical schools, colleges, universities, high schools, and all other training centers now giving aircraft instruction are eligible to use the film by applying to the Film Center. A nominal service fee is charged.

♦ Day trade courses in aircraft welding and aircraft sheet-metal working have been started at Winfield, Kans. Ten cities in Kansas are now conducting nearly thirty courses in nine different trades.

♦ The vocational schools of the country are cooperating with the War Manpower Commission and the Selective Service Commission in the establishment and operation of a plan for the orderly withdrawal of men into the armed services with a minimum interference with production.

The plan involves the use of the Manning Table Plan, a voluntary system for industry in determining the length of time it takes to train replacements and giving the Selective service system information for the orderly withdrawal into the armed forces.

A large part of the training, it is expected, will be done in the vocational schools under the VEND program. There will be a considerable increase in the supplementary type of training which will be as much as 40 to 48 hours per week. Prospective employees will be trained according to specifications and to fit the job of the man going into the armed services. Trainees of this type will be tagged for industry and will be paid by industry while in training.

Under the plan, it is necessary for co-ordinators and supervisors to develop still closer contacts with industry to explain the services of war-production training and work out short intensive courses in cooperation with the employer for trainees who enter the plants as replacements. The program offers a better and more closely co-ordinated-to-industry plan and one which tests the flexibility of each organization in meeting the definite and specific needs of industry.

♦ To take the place of the old-style corrugated steel siding which now is high on the critical list, the Certain-teed Products Corporation has come forward with a new product, Corrugated Asphalt Siding, to take its place.

This is a noncritical, emergency material, especially designed for the construction of such urgently needed buildings as factories, warehouses, storage sheds, machine sheds, dairy barns, poultry and livestock buildings, temporary rain storage, and many other structures.

Corrugated Asphalt Siding consists of two sheets of heavy felt, each soaked in a recently developed resino-bituminous saturant, laminated together with a high-melting-point adhesive, and corrugated. Subjected to severe, practical tests, it has proven its worth as a material that will stand up in all kinds of weather.

♦ Nationwide training of millions of prospective members of the armed forces has been undertaken recently by the American Red Cross to enable them to cope with the deep-water perils of global warfare.

The program, planned especially for young people of preinduction age, will be conducted through Red Cross chapters, in cooperation with schools, colleges, clubs, industrial and community organizations, under the direction of Red Cross water-safety instructors.

The instruction will be given in swimming and water-safety skills and the program will involve the use of every swimming pool and bathing beach in the country. The program has the approval of military leaders because it is recognized that preinduction training of this sort will be of immense value in fitting men for military service.

♦ Gloria Indus Lauer, Ames, Iowa, and Ray Reinhart Schiff, New Rochelle, N. Y., have received the first prize — a four-year Westinghouse science grand scholarship worth $2,400 each — in the recent nationwide annual science talent search contest. The awards were made by the judges at the close of a four-month long quest for the students with the greatest scientific talent among the high school seniors.

The total of the scholarships awarded in the science search sponsored by the Science Clubs

(Continued on page 29A)

★ B U Y ★ M O R E ★ B O N D S ★

School Shops All Over the Land Are Playing Important Parts in Hastening VICTORY

Skilled young men and women, after "basic" training in school shops, are stepping into war plants and taking their places at the machines that are rolling out America's gigantic war production.

But there is still much more equipment . . . and lots of supplies . . . needed by many schools to bring their training plans up to the peak these critical times demand.

In order to serve such schools with typical Brodhead-Garrett service, we suggest that orders be made up at once, and sent in without delay.

1944 B-G Catalog Now Ready!

It features a surprisingly complete stock of machines, equipment and supplies you may need. Please refer to your copy in making up your order. If a copy hasn't yet been received, please write at once.

BRODHEAD-GARRETT CO.

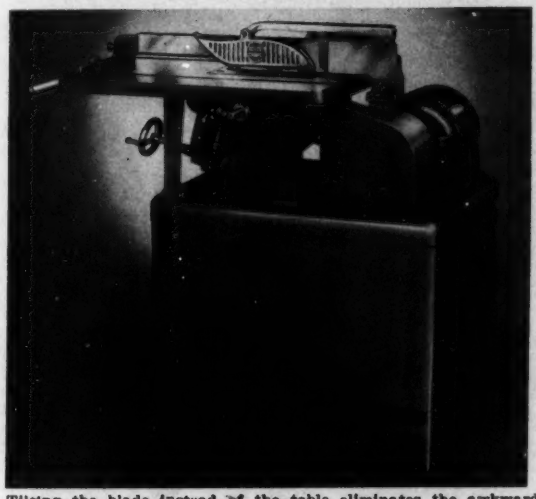
Supplying Defense Training Needs to Schools in All 48 States

CLEVELAND, OHIO

BOICE-CRANE SAFETY-ENGINEERED PRECISION-BUILT SHOP-TESTED POWER TOOLS

MAKE ROOM FOR MORE TRAINEES • EFFECT QUICK SHOP EXPANSION
• ASSURE SAFETY FOR INEXPERIENCED HANDS • AVAILABLE NOW

Consider the Advantages of the
BOICE-CRANE No. 2500 10" TILTING-ARBOR SAW



Tilting the blade instead of the table eliminates the awkward, slow, formerly hazardous method of sawing bevel cuts, and permits more accurate and smoother cutting.

Wide "working zone" in front of blade makes cross-cutting of 13" wide stock easy. 5½" table space behind blade affords plenty of outfeed support.

One-knob lightning-fast fence control with automatic rear fence locking finger, operated from front, aligns fence as it micro-sets, and eliminates the necessity of reaching over the blade. Secure and accurate alignment obtained on first lock-up.

Table bars may be centered on ordinary work or may be instantly extended to 21-inch capacity. Table-extension may be readily attached.

Miter gauge clamp attachment prevents work from creeping away from blade.

Patented "Auto-set" screw stops tilt of blade exactly at 45° and 90°. Degree dial for setting "split-hair" angles.

Large 20" x 27" ground table; heavy ¾" arbor, and grease sealed ball bearings.

Dust chute directs sawdust away from motor.

Quality all the way through, such as totally enclosed grease-packed gearing and ball thrust bearings on both shafts of saw-arbor raising mechanism.

Safety guard approved by State Industrial Safety Commissions. Hood shields entire saw-blade, tilts with the blade, drops to table after passage of work. Hard-tempered splitter spreads lumber so that blade never binds. Anti-kickback dogs hold any thickness of stock up to 3 inches.

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(Continued from page 26A)

of America and the Westinghouse Company is $11,000. The scholarships permit the recipient to attend any college or university of his choice that meets requirements of the scholarship awarding committee.

♦ The Committee on Art in American Education and Society is sponsored by the Museum of Modern Art, New York City. It was organized by several artist-teachers and leaders of art education to foster and promote the creative arts during the war period and to plan for their increased functioning in the reconstruction to follow. The immediate objective of the committee is to mobilize the art efforts of teachers and children throughout America in one great offensive for victory. This offensive will operate under a vast program of art activity carried on in cooperation with the armed forces and civilian defense organizations in schools, homes, and communities. An extensive program has been organized ranging from posters for salvage drives to the training of designers for building the world of tomorrow.

The chairman of the committee is Victor D'Amico, director of the museum's educational project, and head of the fine arts department of the Fieldston School. Inquiries for more detailed information may be addressed to: Mr. D'Amico, Committee on Art in American Education and Society, The Museum of Modern Art, 11 W. 53rd Street, New York City.

♦ To give potential employees and applicants a good background of information about the company with which they may become connected, United Air Lines has compiled an attractive, well-illustrated booklet "About That Job With United Air Lines."

This booklet is designed to tell applicants for jobs and positions about the kinds of openings available, the company's background and policies, its present and future, including the role air transport will play in the postwar period.

Enumerated in the booklet are the general types of jobs which have been made available due to United Air Lines' civilian and military transport activities, and at its large airplane modification base, conducted for the Army.

A feature of the book is the enumeration of employee benefits in addition to salary, including employee education and training, pensions, group insurance, vacations with pay, medical services, employees' suggestion conference, and employee credit union.

United has approximately 6000 employees of whom 20 per cent are women.

♦ The Business Press Industrial Scrap Committee, New York City, has begun a campaign to collect dormant scrap. The campaign is a means of gathering raw material in the form of copper, brass, and bronze scrap.

Schools, especially the school shops, can do much to help this movement.

♦ The industrial-arts department of the State Teachers College, California, Pa., has installed two new pieces of foundry equipment, a core oven and a hood for the furnace. Both pieces were constructed by the shop students, under the direction of their instructor.

♦ "ELECTRONICS AT WORK," an educational motion picture released by Westinghouse, explains the six basic functions of electronic tubes and shows how each type of tube is used in some of the latest industrial and military applications.

Animated drawings showing tube construction are used to explain how the cathode, anode and grid elements rectify, amplify, generate, control, transform light into electric current and transform electric current into light. Precipitron, radio and radio-telephony, high frequency induction heating, resistance welding control, television and industrial and medical X ray are a few of the electronic devices which are illustrated and described to show how the tubes perform in the various applications.

Loaned free for showing at war plants and Engineering and Technical Societies. Write to Department 7-N Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa. This 20-minute sound film is available in 16mm. print.

♦ Electronic applications in industry, in the war, in medicine, and in the home are illustrated and described in a new 44-page booklet announced by Westinghouse Electric and Manufacturing Company.

A few typical applications shown in this booklet "ELECTRONICS AT WORK" are: resistance welding control for sewing plane parts together at 1800 stitches per minute; cathode ray oscillograph for electrical circuit and lightning phenomena analysis at speeds of 1/100 of a millionth of a second; high-frequency induction heating units for plastic molding; tin reflowing and surface hardening; ignitron rectifiers for converting alternating to direct current in aluminum and magnesium production; industrial X-ray units for "inside" inspection of vital metal parts; Precipitron for removing air-borne dust particles as small as 1/250,000 of an inch.

Various types of electronic tubes, key units of every electronic device, for such applications as industrial control, diathermy, power conversion, X ray and radio are illustrated and the primary use of each identified.

A copy of booklet B-3264 may be secured from Department 7-N-20, Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa.

(Continued on next page)

(Continued from previous page)

♦ Invitation to take part in a general 8mm. motion picture camera and projector design competition has been issued by the DeVry Corp., 1111 Armitage Ave., Chicago 14, Ill.

The Design competition starts September 1 and closes December 31, 1943. Awards of $1,500 in U. S. War Bonds will be made for camera design and mechanical ideas, including over-all redesigning of both camera and projector and suggestions as to the mechanical refinement or simplifications of both units, or ideas that make filming and projecting simpler, easier, or reduce the production costs. It is anticipated that awards can be announced by February 1, 1944.

♦ The American Humane Education Society announces its new annual contest for the most outstanding contribution to Humane Education. Open to all educators, the Society will award each year a 14-karat gold key (to be known as the National Humane Key), inscribed on one side with name and date of the winner, and in addition two hundred dollars ($200) in War bonds or cash.

Entries may include projects on a humane theme, humane plays or stories, original methods of teaching humane education, or theses on humane education.

This year's contest closes April 30, 1944. Write for entrance blank and rules of the contest to the National Humane Key Committee, 180 Longwood Ave., Boston 15, Mass.

♦ The C-O-Two Fire Equipment Company, Newark, N. J., has issued a new booklet describing its line of portable and built-in carbon dioxide fire extinguishing equipment and smoke detecting systems.

The booklet, printed in two colors and illustrated, describes the application and operation of various kinds of C-O-Two equipment such as hand extinguishers with the newly developed "Squeez-Grip" valve, hose rack, hose reel and wheeled units, manual and automatic built-in extinguishing systems used for industrial, electrical and marine protection. Smoke detecting systems and recharging equipment are also included.

Copies of the booklet are available on request.

♦ A major difficulty in the riveting of aluminum "skins" over spars and ribs to make wings has always been the unavoidable wrinkling and buckling of the skins under the pounding of riveting hammers. This wrinkling and buckling, even though slight, interferes with the smooth flow of air over and under the wing, and thus impairs the efficiency of the wing and of the whole plane.

A system of "heat therapy" devised by Harry F. Kniesche, Assistant Factory Manager at the Glenn L. Martin plant, solves that difficulty by expanding, then shrinking the skin on the wing. The new process also simplifies and speeds the wing-covering operation. Here's how it works:

The various sheets of aluminum that make up a skin are riveted together on a wood frame that has the shape of the wing. The skin, full now of unavoidable small buckles and wrinkles, is then laid on the wing of the ship. The skin heater, which might be described as an oversized version of the electric heating pad, which has the exact contour of the wing, is then laid on top of the skin.

The heat is turned on, and in a few minutes the skin has a temperature of 140 degrees. This causes enough expansion to rid it of all wrinkles and buckles. Then while the rheostats hold the temperature constant, the skin is quickly stitch-riveted round the edges and along the ribs. Then the heater is removed and the skin shrinks as taut and unwrinkled as a drumhead.

♦ President Roosevelt on July 12, 1943, approved Public Law 135, 78th Congress, first session, which included an appropriation of $90,000,000 for the conduct of the program of Vocational Training for War-Production Workers in the public vocational schools during the fiscal year ending June 30, 1944.

This is the fourth year for which the training of workers for war production industry has been approved. The training program in courses with less than college grade was also approved July 1, 1940. During the first 3 years of the conduct of the program, more than 5 million workers, including approximately 800,000 women, were trained in approximately 2800 vocational schools and shops.

♦ Designed to fit men and women for American Red Cross recreational work with troops overseas, a new basic recreational training school has just opened at American University, Washington, D. C., it was announced by Norman Davis, Red Cross chairman.

Under the expert direction of G. Ott Romney, veteran Red Cross worker recently returned from England where he was in charge of all Red Cross clubs, the school will put each student through four weeks of intensive training, which in peacetime would require many months.

The recreational training classes will be in session seven hours daily, five and a half days a week. Three evenings each week also will be devoted to study.

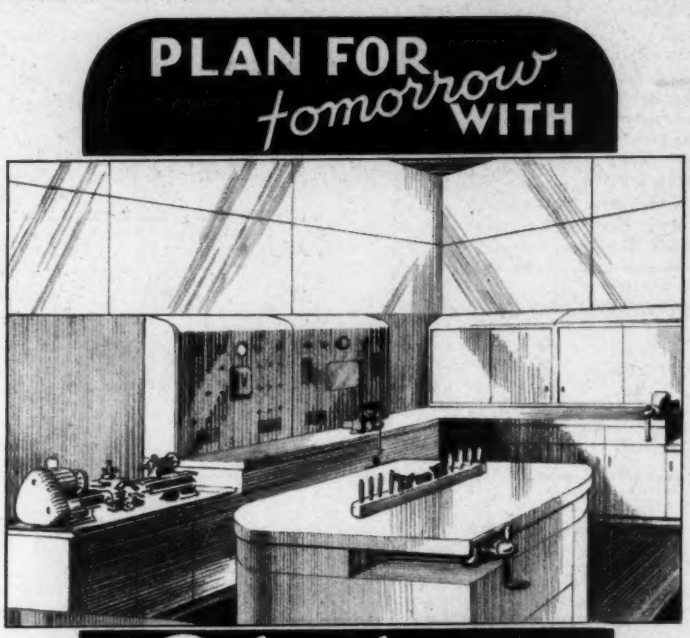
Instruction includes such courses as interpretation of recreation, analysis of group and individual recreation needs, program planning, wartime entertainment trends, and dramatics.

ACCOMPLISHMENTS OF SAFETY EDUCATION

The lives of 300,000 Americans have been saved since the national safety movement began in 1913.

This is revealed in the 1943 edition of "Accident Facts," the annual statistical yearbook pub-

(Continued on page 34A)



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Take time now to write and request that our Field Engineer call—you will find these engineers keenly alert to your needs. You will find them capable in helping you visualize and reduce to practice the ideas which you are formulating.

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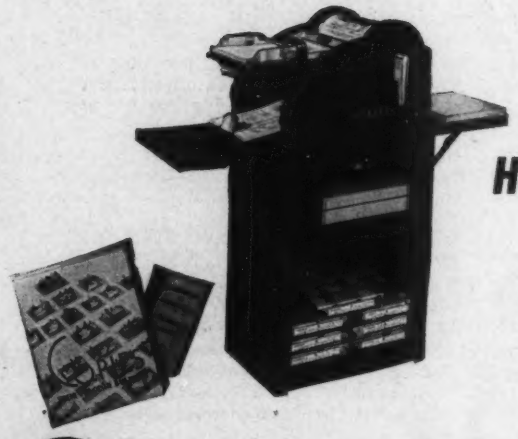

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You can do *your* part by familiarizing your students with DITTO machines and methods. Knowledge of DITTO Systems will help them to succeed as it has helped industry to achieve miracles of production efficiency.

Today, as always, genuine Ditto supplies are available for keeping previously purchased gelatin and liquid type machines operating at top efficiency.

Write TODAY on your letterhead for FREE copies of folders explaining new DITTO teaching methods. You'll find them invaluable in your work of training workers. Address DITTO, Inc., 2245 W. Harrison St., Chicago 12, Illinois.

DITTO, Inc., 2245 West Harrison Street, Chicago 12, Illinois

Supervisor's Check List

SAM HITCHCOCK*

This check list was developed at a state meeting called for local supervisors of war-production training. It was felt that a better job of supervision could be done by local supervisors if they were given a definite check list. In order to check the quality of instruction in a given school, the supervisor is asked to fill out a check list for each shop instructor in that school.

The check list was worked out by local supervisors of Wyoming.

I. *Office*
- A. Is there efficient work in progress?..... .....
  - 1. Are all working? ....
- B. Good Organization
  - 1. Housekeeping ....
  - 2. Equipment ....
- C. Dealing with Public
  - 1. Visitors ....
  - 2. Students ....
  - 3. Teachers ....
- D. Record Keeping..... .....

II. *Supervision*
- A. Is there evidence of effective over-all supervision? ....
- B. Is there conservation of time, material, and equipment? ....
- C. Is there war-production spirit?..... .....

III. *Janitorial Service*
- A. Windows ....
- B. Floor ....
- C. Toilets ....
- D. Heating units ....
- E. Equipment ....

IV. *Toolroom*
- A. System (checking) ....
- B. Keeper — Appearance ....
  - Relationship..... Ability ....
  - Attitude..... Personality ....
- C. Arrangement ....
- D. Lighting ....
- E. Adequacy ....

V. *Sanitation*
- A. Lavatories ....
- B. Drinking fountain ....

VI. *Exterior Appearance*
- A. Directional signs ....

VII. *First Aid*
- A. Operator — Name..... Qualified..... .....
- B. Are all first-aid cases handled by a qualified first aider?..... .....
- C. First-Aid Kit
  - 1. Bandaids ..... 6. Swab sticks (Ind. Pack)..
  - 2. Gauze (Ind. Pack)..... 7. Castor oil .....
  - 3. Picric acid gauze..... 8. Blanket, sealed .....
  - 4. Bottle sterile water..... 9. Tourniquet .....
  - 5. Ammonia vial ..... 10. Alcohol .....
  - Remarks .....
  - .....

VIII. *Shop*
- A. Organization of..... .....
  - 1. Equipment ....
    - *a*) Arrangement ....
    - *b*) Condition ....
    - *c*) Adequacy ....
  - 2. Supplies ....
    - *a*) Arrangement ....
    - *b*) Adequacy ....
- B. Ventilation ....
- C. Lighting ....
- D. Heating ....
- E. Sanitation (helmets and goggles)..... .....
- F. Housekeeping (janitorial service-workers policing) ....
- G. Fire prevention ....
- H. Safety ....
  - 1. Helmets and goggles..... .....
  - 2. Practices ....
  - 3. Clothing ....
  - 4. Belt guards ....
  - 5. Switches ....
  - 6. Grinders ....
  - 7. Booths ....
  - 8. Aisles clear ....

IX. *Quality of Instruction*
- A. Workers Activities:
  - 1. Is there an industrial atmosphere in the shop? ....
  - 2. Are all learners working?..... .....
  - 3. Are all learners working to a good plan? ....
  - 4. Do workers know *what* and *why* they are doing a certain job?..... .....
  - 5. Working from plan, blueprint, sketch, work sheet, operation sheet, sample, job sheet ....
  - 6. Is the student interested in job?.... .....
  - 7. Are learners using correct job techniques? ....
  - 8. Is this a production shop?..... .....
  - 9. Effective use of equipment in regard to safety? ....
  - 10. Is there conservation of man power by getting training done in shortest possible time? ....
  - 11. Is there conservation of materials? (no waste) ....
  - 12. Is there conservation of machines? (minimum breakage) ....
- B. Instruction:
  - 1. Is instructor present?..... .....
  - 2. Is instructor teaching?..... .....
  - 3. Appearance in keeping with job, shop coat? ....
  - 4. Is he giving help or instruction wherever and whenever needed?.... .....
  - 5. Are learners failing to get instruction when needed? ....
  - 6. Does the teacher have a well-prepared plan? ....
  - 7. Is instructor prepared to handle his class? ....
  - 8. Is instructor using four steps:
    - *a*) Prepare ....
    - *b*) Present ....
    - *c*) Practice ....
    - *d*) Put on production..... .....
  - 9. Are visible progress records kept up to date? ....
  - 10. Is the instructor qualified?..... .....
  - 11. Does production show finished workmanship? ....

*State Director of Vocational Education, Cheyenne, Wyo.

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PORTER-CABLE MACHINES

Porter-Cable Wet-Dry Belt Surfacers are so far ahead of other finishing methods, it was inevitable that industry should call for them in ever increasing numbers. Aircraft plants, plastic manufacturers, shipyards and munition factories are depending more and more on this modern machining method, to relieve or supersede millers, shapers, planers, grinders. Train your students with the machines that they'll encounter in many shops when they graduate!

Porter-Cable G-8 Wet-Dry Belt Surfacer

Where precision finishing is required, surfacing can be held to an accuracy of .0005" or less for flatness. Most jobs are done freehand, or with simple fixtures. In most cases, a single presentation to the fast-cutting, diamond-hard abrasive belt gives a dead-flat, glass-smooth finish to plastics, metals, compositions. The coolant eliminates heating, discoloring, warping, dust. The belt is washed constantly, thus kept free of grits and at high-cutting efficiency.

Porter-Cable B-6 Wet-Dry Belt Surfacer

Designed for irregular or curved work, its flexible abrasive belt, wet or dry, follows the contours and produces an even, uniform finish. Adjustable backing plate for flat or uniformly curved surfaces.

Porter-Cable G-4 Belt Surfacer

With adjustable position (either horizontal or vertical), this model is recommended for finishing small parts. Many light milling and grinding operations done without fixtures. Popular for second operation work. Used in many toolrooms. Slotted table adjustable up to 45°, for machining angled surfaces.

TAKE-ABOUT The Dustless Sander

The world's most popular sander. Perfect balance — instant belt change — dust-free operation — silent chain drive — an extra powerful motor — all help achieve faster, easier, finer sanding. Give them the machine that gives their work a craftsman's finish.

Speedmatic Saws

Their scientific design makes for perfect balance, eliminating arm strain and cramped muscles. The higher efficiency of the helical gear provides power to spare. The blade enters the cut at 7,000 revolutions per minute — so fast it practically feeds itself. No overloading — no stalling.

Speedmatic Floor Sanders

A favorite with floor contractors and operators. Its balanced high-speed drum, its extra-powered motor, its easy, feel-of-the-floor adjustment, its high-vacuum dust collection, make Speedmatic out-perform all the others.

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(Continued from page 30A)

lished by the National Safety Council, 20 North Wacker Drive, Chicago 6, Ill.

A box score of accidents contained in the book shows that the death rate has been lowered each year in the 30-year period between 1913 and 1943, except for 1917 and 1936. In 1913 the rate was 85.5 per 100,000 population. Last year it was 69.3.

During the triple decade there were 2,707,000 accidental deaths. If the death rate had been as high each year as it was in 1913, this number would have risen to 3,004,000.

WHAT IT TAKES TO TRAIN THE CREW OF A BATTLESHIP OR AN INFANTRY REGIMENT

According to the Office of War Information, the men it takes to operate the machines on one large battleship represent at least 1500 aggregate years of training and 2500 years of experience.

Of the 2000 enlisted men on an average battleship:

All must have 8 weeks' basic naval training;

About 500 must have an additional 16 weeks of naval technical training beyond their basic training;

Another 500 must have this training and an additional advance training course (a total of 32 weeks or more) before joining the fleet;

Another 500 must have had considerable sea experience, and at least one term in Fleet School or another of the advance training schools;

About 80 per cent of the men must complete the equivalent of trade school courses during their naval service;

All of them must continue to study and train as long as they are in active service.

Of the 100 officers:

About 50 are Annapolis graduates; the others have come out of the Naval R.O.T.C. courses and Midshipman Reserve Schools, or out of the ranks of Chief Petty or Warrant Officers;

The Captain has probably had 30 years of Naval service;

The executive officer, a Commander, has probably had 20 years;

The heads of departments (gunnery, navigation, engineering, construction, communications, medical, and supply), usually Commanders or Lieutenant Commanders, average 12 to 16 years service;

Division officers and junior division officers in each department average 5 years service.

For the complement of 2100 there are 2100 assigned jobs, each one specialized yet requiring the highest degree of teamwork with the others.

What it Takes to Train an Infantry Regiment

The training required of an infantry regiment is equally impressive. Of the approximately 3000 men in the average regiment, each combat soldier must have the equivalent of:

14 weeks individual training;

12 weeks unit training (which prepares the regiment to operate as a unit);

12 weeks combined training (which prepares the infantry regiment to operate as an efficient combat team with the artillery and other units, so that the division may fight as a unit);

8 to 10 weeks field maneuvers, under simulated battle conditions.

The service specialists in the regiment (drivers, cooks, clerks, communications experts, mechanics of all kinds, armorers, intelligence and reconnaissance men, ammunition and pioneer details, and medical sections) are detailed somewhere in the process for 8 to 12 weeks specialized training, then returned for continued training with their units. Some of the approximately 140 officers have probably come out of West Point or another military school, and had as much as 30 years military experience. All of them, from the commanding colonel to the newest second lieutenant just out of officer candidate school, have had advanced training, many of them in staff schools like the command school at Leavenworth or various service schools. A number of them (like the regimental surgeon, the personnel officer, the chaplains) have had long training as civilian specialists before they began their military training. On conservative figuring, it takes 3000 man-years of training to put a good infantry regiment into the field.

Filing Hints to meet war-time needs

HELLER MADE IN U.S.A.

SELECT THE RIGHT FILE FOR THE JOB

Files are of many different sizes, shapes, cuts and types. Yet every file has particular applications which it can do better than any other file. Making the beginner acquainted with these uses of the more common types of files is a basic part of school shop instruction. For example, Machinists' Files are employed generally as follows:

TYPICAL APPLICATIONS OF MACHINISTS' FILES

Filing Job	Shape to Use
Filing flat surfaces, and all general-purpose work.	Flat, Hand
Keyways, slots, similar work.	Pillar, Square
Narrow work requiring thin file.	Warding
Work requiring acute angles.	Knife
Convex or concave surfaces.	Half-Round, Round
Enlarging round holes.	Round

WRONG: Don't use a coarse file on fine work.

RIGHT: Fine work requires a fine file.

WRONG: Don't use a fine file on coarse, heavy work.

RIGHT: Coarse work should be handled with a coarse file.

☆ ☆ ☆

"More cuts with NUCUTS" means just what it says—you can file more, faster, better, with less effort with a NUCUT File.

For detailed recommendations on the proper application not only of Machinists' Files but also of Mill and Saw Files, Swiss Patterns, Rasps, Special-Purpose Files and Milled Curved-Tooth Files, helpful charts have been prepared that are available on request.

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New Publications

Elements of Radio

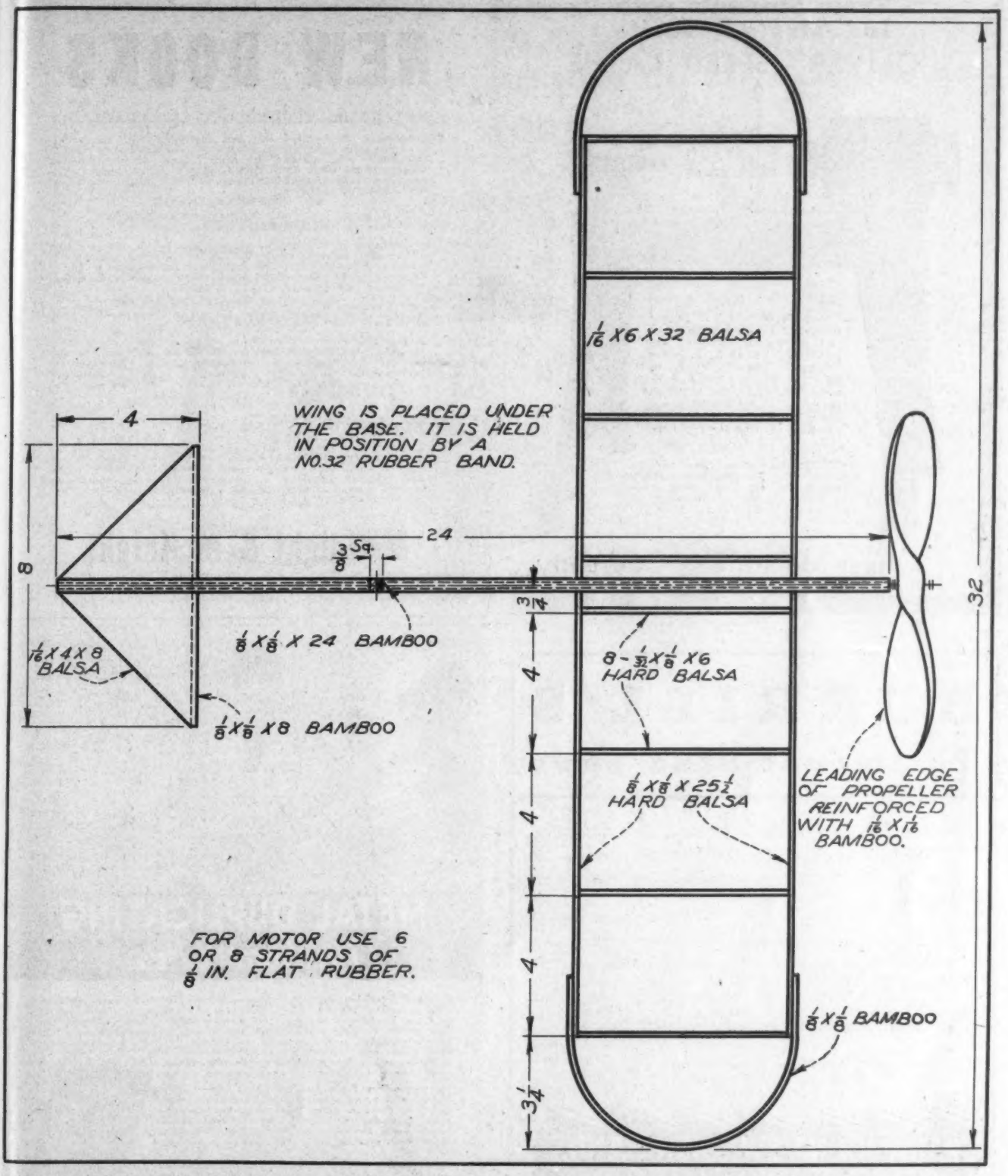
By Ralph E. Horton, Abraham Marcus, and William Marcus. Cloth, 699 pages, 6⅛ by 9⅛ in., illustrated. Price — special edition for schools only — one volume $3.20, two volumes, $1.96 each. Prentice-Hall, Inc., New York, N. Y.

This book was written by teachers of radio who believe that the student's interest in the subject must be capitalized by teaching him the operation of the radio receiver which he has at home, and then introduce him to the theory underlying its operation.

The book is divided into two parts.

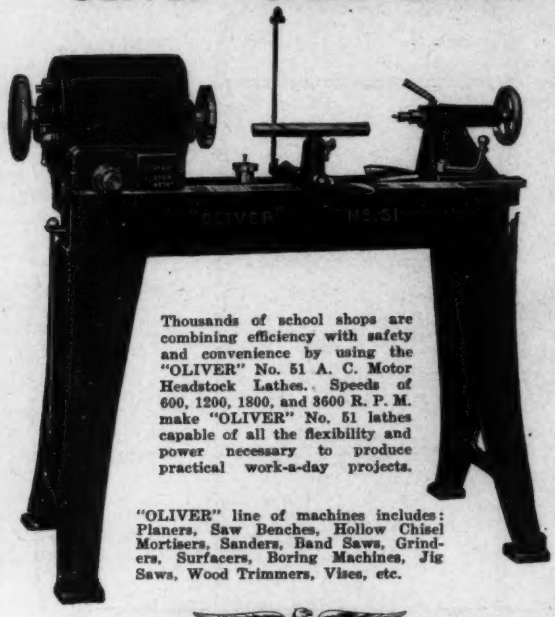
Part I contains 28 chapters which present the matter in the following sequence: history of communication, wave motion, simple receiving set, aerial-ground system, tuner, reproducer, detector, antenna coupler, electron flow, the vacuum detector (diode and triode), regenerative detector, audio-frequency amplifier, eliminating

(Continued on page 38A)


1/16 X 6 X 32 BALSA
WING IS PLACED UNDER THE BASE. IT IS HELD IN POSITION BY A NO.32 RUBBER BAND.
4
24
8
3/8 Sq.
3/4
32
1/8 X 1/8 X 24 BAMBOO
1/16 X 4 X 8 BALSA
1/8 X 1/8 X 8 BAMBOO
8 - 1/32 X 1/8 X 6 HARD BALSA
1/8 X 1/8 X 25 1/2 HARD BALSA
LEADING EDGE OF PROPELLER REINFORCED WITH 1/16 X 1/16 BAMBOO.
FOR MOTOR USE 6 OR 8 STRANDS OF 1/8 IN. FLAT RUBBER.
1/8 X 1/8 BAMBOO
4
4
4
3 1/4

Goose-neck pusher plane submitted by Terence Vincent, U. S. Director of Miniature Aircrafters, Ypsilanti, Mich.

Train Students with Industry's Favorite "OLIVER" SPEED LATHE



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  A streamlined refresher handbook condensed to vest-pocket size. Covers fractions, decimals, square root, and other basic information. Indexed for quick reference to formulas, charts, tables, and rules of standard job practices. Offers information on tapers, cutting speeds, threads, strength of materials, etc. List $1.00. GREENAWALT

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Without Dies

DI-ACRO Precision Machines—Shears, Brakes, Benders—have made possible a method of "DIE-LESS DUPLICATING" that practically amounts to a new production technique for making a great variety of small parts and pieces. Leading schools and universities are equipped with these bench machines, and thousands are in use by War Industries, saving Man Hours and Critical Materials. Their ease of operation makes them ideal for use by girls. Investigate their possibilities for your training courses.

In illustration from left to right: 1st—Di-Acro Shear squares and sizes material, cuts strips, makes splits or notches. 2nd—Di-Acro Brake forms angles, channels or "Vees." 3rd—Di-Acro Bender bends angle, channel, rod, tubing, wire, moulding, strip stock, etc. All duplicated work is accurate to .001".

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WESTON ELECTRICAL INSTRUMENT CORPORATION, 595 Frelinghuysen Avenue, Newark, N. J.

WROUGHT-IRON FERNERY

CLYDE R. SUTFIN

West Side Union High School
Los Banos, Calif.

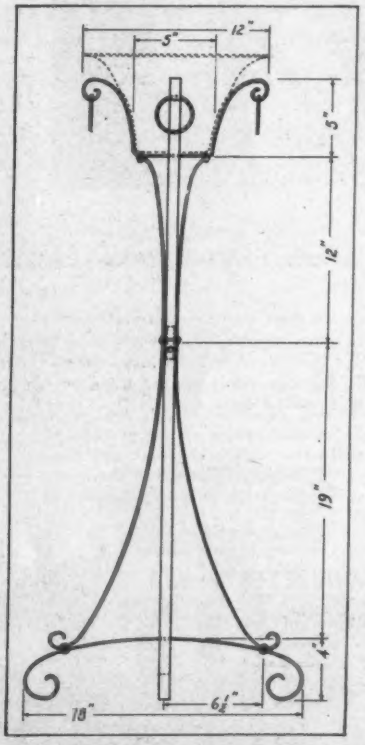
Ferneries are always in demand and the one shown herewith has for several years been the favorite over many of the common designs by the students in our shop.

This project is on the junior or senior high school level in either the general shop or metal class, and if spinning is done in the department the bowl is easily spun from sheet metal. If a bowl is purchased the design of the metal holding it must, of course, be changed to conform to the contour of its sides.

The band iron is cut to length and peened on both sides and all ends should be rounded by file or grindstone, or if you have a forge, widen the ends for 1½-in.

All pieces are then made perfectly straight both sideways and edgewise with no twist in the metal, or difficulty will come later when assembling, as the pieces will not line up properly. In order to bring out the high lights or peen marks, the metal should be given a thin coat of black lacquer and then rubbed with emery cloth. If given too thick a coat it will be difficult to sand down and if lacquered after it is assembled it will be impossible to emery in the corners.

Make a full-size drawing of half of the profile view and before bending the feet and pot holder, center punch a mark in their middle and form them according to your pattern, keeping the mark on the center in your drawing so you will not have one side long and the other short; then rivet these pieces together in their center.



Wrought-iron fernery designed by C. R. Sutfin

Bend the four legs and test them for the same length from top to bottom where the rivets will come and see that you have no partial twist in them. Have your instructor check; then assemble by first riveting the legs to the feet. To make the fernery stand straight a hole is next made in one leg at the spacer section and one hole in the spacer block. A temporary rivet is slipped through these holes and with the feet of the fernery on the floor at a level spot, move the legs, at the spacer section, until they stand perpendicular. The rivet hole is then marked at the proper place in the opposite leg for the temporary rivet to pass through. Rivet this and in the same manner determine the rivet holes for the other legs.

The top of the legs are then adjusted to receive the pot holder, after which they are riveted in place.

To set off the project, rings of about 3-in. outside diameter are made of twisted ¼-in. square stock. To keep this metal straight while twisting, a ½-in. pipe is slipped over it between vise and a wrench and the wrench turned until the iron has the twist desired. The rings are then made from the long piece one at a time and sawed off as made because four short irons would be harder to work with.

Finish the article with a heavy coat of clear lacquer, with two coats of green on the inside of the pot, to prevent rusting.

(Continued from page 34A)

the A, B, and C batteries, a.c. and d.c. power supply, dynamic speaker, radio-frequency amplifier, volume and tone control, superheterodyne receiver, vacuum tubes, and radio direction finders.

Part II discusses the nature of electricity, magnetism and measuring instruments, a.c. currents, inductance, reactance and impedance, capacitance, resonant circuits and tuning principles, electromagnetic wave, antennas, tube characteristics, amplifiers, oscillators, continuous-wave transmitter, modulated-wave transmitter, and the cathode-ray tube.

Demonstrations for both parts of the book also are outlined so as to make the work of the teacher as easy as possible.

Electrical and Radio Dictionary

By Carl H. Dunlap and Enno R. Hahn. Cloth, 110 pages, 5⅝ by 8⅜ in., illustrated. Price, $1. American Technical Society, Chicago, Ill.

(Continued on page 44A)

Shop Equipment News

New Products — Publications

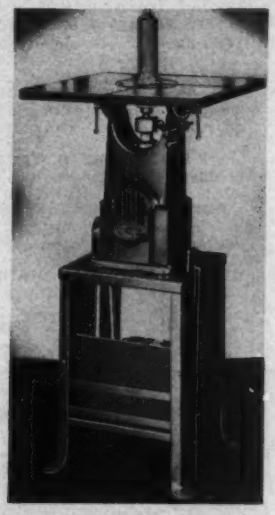
A NEW OSCILLATING-SPINDLE SANDER

The new oscillating spindle sander, offered by Boice-Crane Company, 932 Central Ave., Toledo, Ohio, uses the smallest diameter abrasive sleeve of any low priced spindle sander. It provides a full range of sizes, ¾, 1½, 2, and 3-in.

Portable and vibrationless, this spindle sander sands any degree of bevel up to 6 in. in height. It can be used for grinding aluminum, masonite, brass, die castings and sheet iron for templates.

Faces which blend gradually through different slopes at successive cross sections can be sanded, doing a job which has been impossible on other type sanders.

The sand drum oscillates automatically through a 7/16-in. stroke, 83 complete strokes at 2500 revolutions per minute, sanding silky smooth with the coarsest, fastest cutting abrasives, an automatic protection against scoring.



Oscillating-spindle sander

The extra large, 20 by 20-in. table, tilts 45 deg. both ways. It is geared for close setting. Two scribed index lines show exact positions for beveling, drafting patterns, and for core-box work.

The ¾-in. and 2-in. nesting rings are regular equipment. The crank case is dust- and leakproof. Bearings are grease packed and factory sealed.

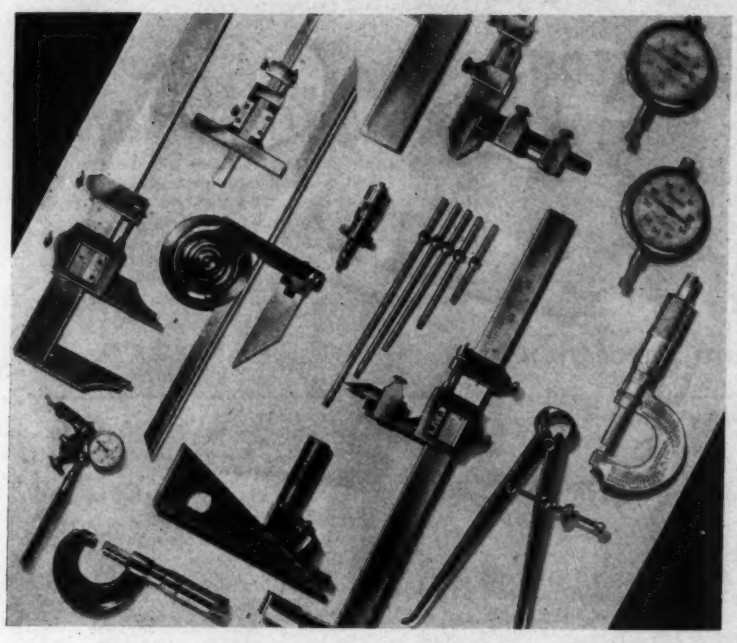
For brief reference use IAVE—810.

A DIVERSIFIED BENDER

A new machine known as the Di-Acro Bender No. 3, has been produced and developed by the O'Neil-Irwin Mfg. Co., Minneapolis, Minn., especially for aircraft and marine work, because of the demand of customers for a bender capable of

(Continued on page 40A)

The Di-Acro Bender No. 3



You're Putting STARRETT TOOLS *in Good Hands*

Fashioning the Micrometers, the Vernier Gages, the Dial Indicators and countless other Precision Tools essential for war production continues to demand the supreme efforts of the Starrett organization.

We are doing our utmost to get these tools into the hands that count most heavily toward the successful conclusion of the one big job. At the same time we must maintain Starrett standards of accuracy and workmanship in order that Starrett Tools may contribute the utmost speed, precision and confidence to those hands.

Your understanding of our problem of distribution and your great and continued contribution to the great objective of us all is sincerely appreciated by

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World's Greatest Toolmakers

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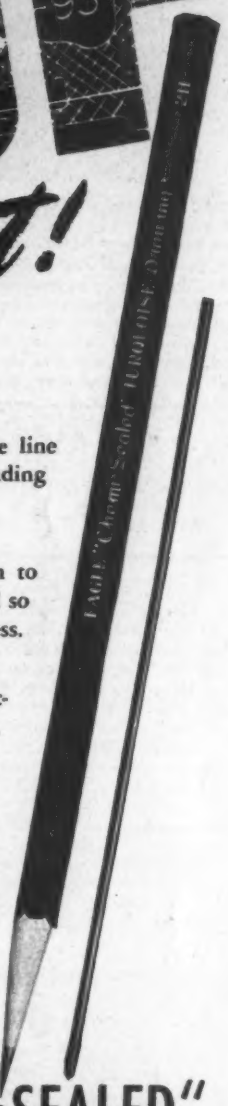

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REMARKABLE DURABILITY—*Electronic graphite, refined down to particle sizes of one micron (1/25,000th of an inch) makes TURQUOISE lead so dense and durable that the longest line remains uniform in width and blackness.

OUTSTANDING STRENGTH—Eagle's patented super bonding process welds lead and wood into one inseparable unit which resists point breakage. TURQUOISE stands up when you bear down, saving time-wasting interruptions.

OPAQUE LINES—The dense, fine-textured lead in every TURQUOISE pencil deposits clean lines of such opacity that you get clear, sharp blueprints *direct from your pencil tracings.*

FAST-FLOWING SMOOTHNESS—Every tiny particle of TURQUOISE lead is lubricated with rare waxes, sealed in for *permanent smoothness.* Its swift, effortless strokes speed your work and save your energy.

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This book gives you a comprehensive picture of the fundamental laws and principles governing communications practice. You will know the instruments and apparatus used—what they look like—how they work. You will know the symbols and language of the trade, and learn to figure quickly daily problems. This book will give you a foundation that will serve you well at all times and prepare you for advanced work in the field.

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FREE! "FIRST-AID" GLUING HANDBOOK

For Instructors of Advanced Woodworking Classes

● Written for inspectors and glue-room foremen in industry, the "Casco Trouble Shooter" for joint gluing is helpful as a practical text and reference book for vocational instructors—especially those teaching aircraft woodworking.

Subjects include: How to identify the cause of a poor glue joint; The mechanics of casein and resin glue; Common gluing faults and their remedies; Mixing, spreading, pressing and maturing procedures, etc. 22 pages. Easy to read.

Your copy gladly sent if you request on school letterhead.

CASEIN COMPANY OF AMERICA
DIVISION OF THE BORDEN COMPANY
350 MADISON AVENUE, DEPT. VE 10, NEW YORK 17, N. Y.

(Continued from page 38A)

forming greater diameters than is possible with the smaller model Di-Acro Benders.

This new unit is heavier and more rugged throughout than the smaller models and has a considerably greater radius forming capacity. It is so designed that it can be readily converted into a highly specialized Bender capable of forming many types of regular or irregular shaped materials, including spring tempered metals, within their ductile limits.

For brief reference use IAVE—811.

HANDBOOK OF PRINT-MAKING AND PROCESSING

The Paragon-Revolute Corp. of Rochester, N. Y., has just issued a new *Handbook of Print-Making and Processing*, covering the use of blueprints, direct process prints, sepia prints, and reproduced tracings. This book lists the advantages of each, and gives a simple and direct answer to many of the questions asked by other department heads, customers, and employees relative to these various processes.

Revolute 8Q Printer

Revolute's Revolving Contact Principle of Printing is also thoroughly discussed, as are the different types of lamps used for exposing the sensitized materials.

Announcement is also made in the handbook of the new Revolute 8Q Printer. This printer is easy to operate, occupies a small floor space, and will expose blueprints, direct process prints, and sepia negatives up to 54 in. wide. Speeds range from 6 in. to 32 lineal feet per minute. It incorporates revolving contact and uses a quartz high pressure mercury vapor lamp, drawing approximately 75 watts per lineal inch.

For brief reference use IAVE—812.

FIRE EXTINGUISHER CHARTS

American-LaFrance-Foamite Corp., Elmira, N. Y., announces two new fire extinguisher charts, showing the operating characteristics of first-aid hand fire extinguishers and wheeled engines.

The charts clearly and concisely tabulate the several types of hand fire extinguishers and wheeled engines, and their suitability or otherwise as applying to Class *A*, *B*, and *C* fires, in accordance with Underwriter's Laboratories classification. For convenience, a Class *D* is added to cover the fire hazards of automobiles, commercial trucks, etc., and a Class *DT* to cover the fire risks pertaining to tank-trucks and trailer-tractors.

Recommendations are also included for alcohol and kindred fire hazards.

The charts give complete data in condensed form as to extinguisher and engine characteristics, methods of operation, capacity, range of stream, etc.

Under the present emergency conditions, it is of paramount importance that each type of extinguisher be fully understood; that one type is the right kind to use on one type of fire, while another extinguisher, misapplied, might prove disastrous. The charts give this information, and afford an invaluable fire-fighting guide. They are free upon request.

For brief reference use IAVE—813.

NEW, IMPROVED GLUE FOR WOOD

Teachers of woodworking will be interested in the new glue, Cascophen LT-67, developed at Casein Company of America Research Laboratories.

This phenol-resin glue, combining many of the most durable properties of phenol-resin, urea-resin and casein glues, is now used in the con-

Improved glue for wood

struction of aircraft, barges, boat keels, and other military wood products.

Important properties of Cascophen LT-67 are:

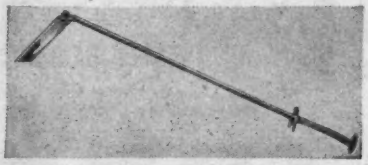
1. *Durable.* Proof against boiling water, cold water, dry heat, extreme cold, mold and bacteria, organic solvents.
2. *Nonacid.* Does not weaken wood fibres adjacent to the glue line.
3. *Wide range of setting temperatures* — 70 deg. F and up for softwoods, 110 deg. F and up for hardwoods.
4. *Noncrazing.* Has good filling action on rough surfaces.
5. *Long permissible assembly period.*
6. *Low pressure adequate.*
7. *Adaptable* — to assembly (joint) gluing, laminating, hot pressing or bag-gluing.

Technical Bulletin 104a describes Cascophen LT-67 in detail and is available on request of any woodworking teacher who writes to Casein Company of America, 350 Madison Ave., New York, N. Y.

For brief reference use IAVE—814.

SEE-EEE-ZEE MIRRORVIEW

The blue point See-Eee-Zee mirrorview, manufactured by the Snap-on-Tools Corporation, Kenosha, Wis., has been designed for various present-day assembly operations in connection with machine-shop work, service, and maintenance where it is necessary to inspect work from behind, or where obstructions block the view and the only means of seeing the work is with an inspection mirror.



A useful feature of the tool is the convenient locking device, operated by one hand, by means of which the mirror can be locked at any position within a 90-degree arc after the mirror has been inserted past obstructions.

The tool is constructed of tubing, rod, and sheet metal, is zinc plated, and works freely and easily.

Two sizes of this useful instrument are available, as are also replacement mirrors which may be inserted easily into the holder.

For brief reference use IAVE—815.

NEW SLIDES FOR AIRCRAFT IDENTIFICATION KIT

A supplementary unit of 15 new aircraft silhouettes in 2 by 2-in. miniature slides for Flying magazine's Aircraft Identification Kit, recently announced by the Society for Visual Education, Inc., 100 East Ohio St., Chicago, Ill., is now ready for distribution to the hundreds of users of this kit.

The aircraft, and the numbers assigned to them in the kit are: 113. Hawker Typhoon IB; 114. DeHavilland Mosquito; 115. Boeing Clipper ("314"); 116. Lockheed-Vega Ventura; 117. Lockheed Constellation.

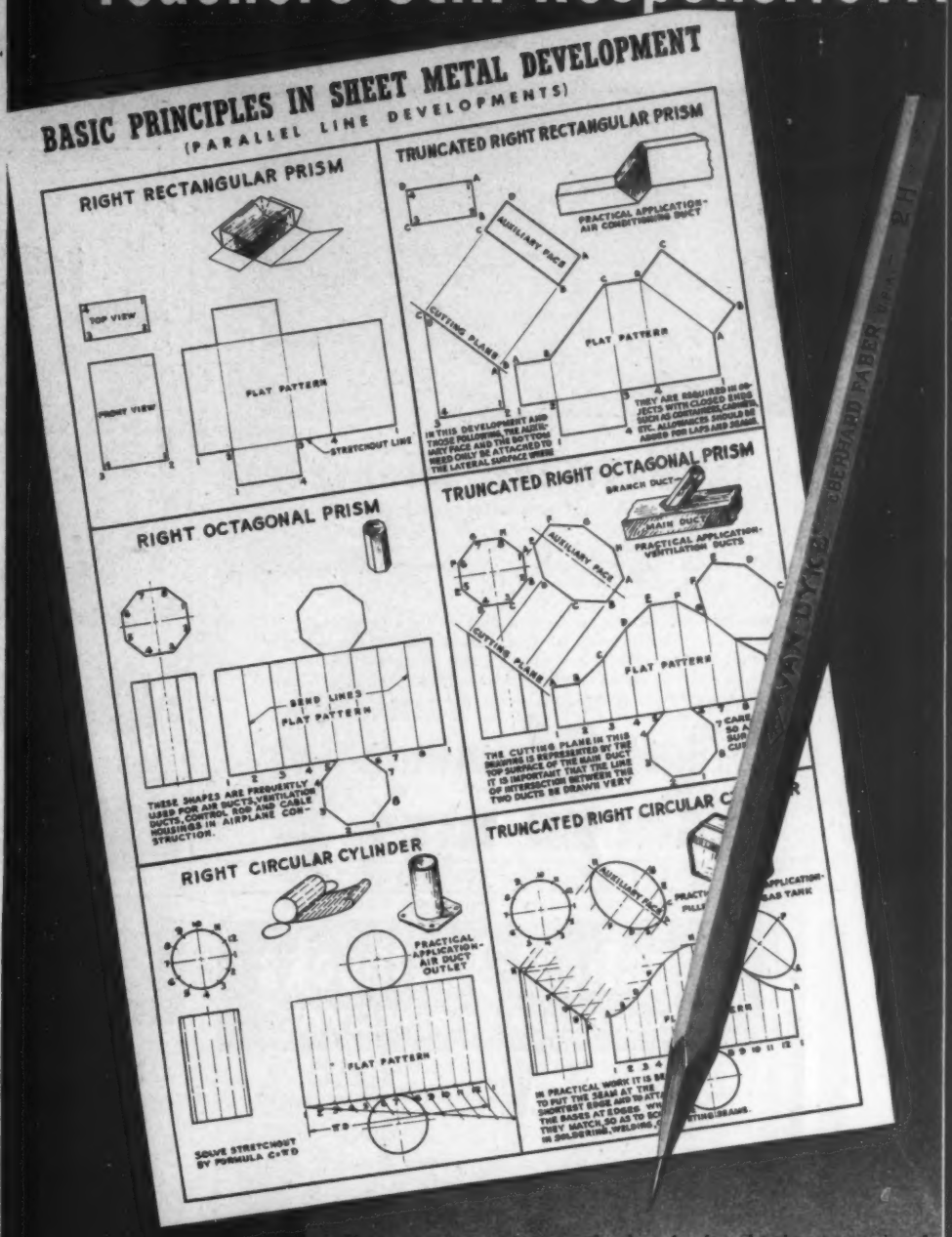
Three individual silhouettes on separate slides show side, bottom, and front views of each type of aircraft.

For brief reference use IAVE—816.

ARMY-NAVY "E" AWARD

The Under-Secretary of War, Robert P. Patterson, and the Under-Secretary of the Navy, James N. Forrestal, have announced the awarding of the "E" pennant to Chicago Wheel and Mfg. Co., Chicago, Ill. The plant will fiy the Army-Navy Production Award pennant and all civilian employees will be given Army-Navy "E" pins.

Teachers Still Responsive...



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If you were not among the hundreds who have previously asked for a FREE copy of this Classroom Wall Chart (16½ x 26½ ins.) there is still time. The supply is not unlimited; for this reason a quick response on your part may prevent disappointment... There is no cost—nor implied obligation. If we can help you develop drafting skill at this time of the Nation's need, good purposes will be served! If it serves also to keep our name and MICROTOMIC VAN DYKE pencils in the forefront of your interest, so much the better. CLIP THE COUPON AT ONCE!

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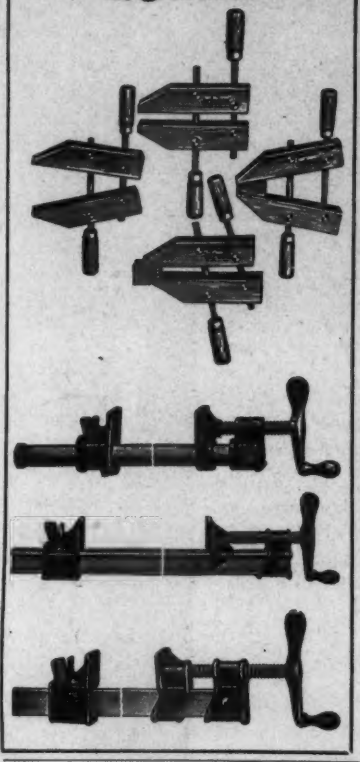

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Genuine "PONY" Clamps are designed, manufactured and guaranteed by us also. Style No. 50 "PONY" Clamp Fixtures are recommended for schools because they attach to ordinary ¾" pipe to make clamps of any desired length, providing low-cost, light, strong clamps for work of any size. Equipped with the finest and exclusive "Multiple Disc Clutch" holding device, which "zips" to position and stays put any place.

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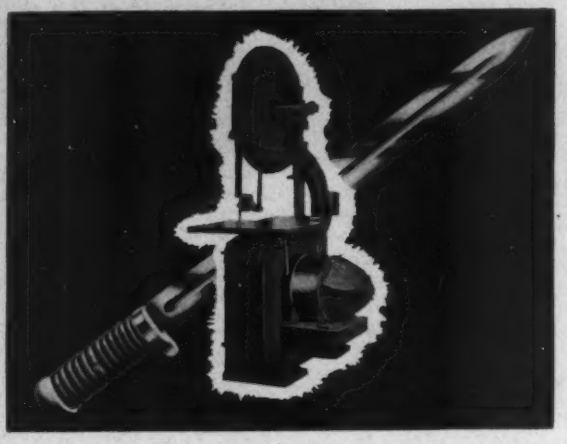

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(Continued from page 38A)

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By R. E. Williams and Charles A. Scarlott. Cloth, 132 pages, 6½ by 9½ in., illustrated. Price, $1.04. American Book Co., New York, N. Y.

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Principles and Practice of Radio Servicing

By H. J. Hicks. Cloth, 391 pages, 6⅛ by 9⅛ in., illustrated. Price, $3.50. McGraw-Hill Book Co., New York, N. Y.

The second edition of this book which presents the subject matter in a simple manner, devoid of deep mathematical discussion. It was written especially for radio servicemen, and treats the subject under the following headings: fundamentals of magnetism and electricity; the radio; radio tubes; testing equipment; radio-frequency amplifiers; audio-frequency amplifiers; power supplies; detection system; volume, tone, and frequency control; loud-speakers; antennas and static; superheterodynes; frequency-modulated receivers; servicing radio receivers; public-address systems; and the business side of radio servicing.

Elements of Radio

By Charles I. Hellman. Cloth, 318 pages, 6¼ by 9¼ in., illustrated. Price, $2. D. Van Nostrand Co., New York, N. Y.

This book was written to meet the requirements of the preinduction training courses. It is divided into 18 chapters, which cover the subject under the following headings: the problem of radio communication, electrical theory, a.c. current, inductance, capacitance, resonance, thermal emission and the diode, triode and multigrid tubes, audio amplification, oscillators, telegraph transmitters, telephone transmitters, antennas, detection of radio waves, radio receivers, power supplies for transmitters and receivers, cathode-ray oscilloscope, and applications of electronics.

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By William J. Kennedy. Cloth, 337 pages, 5⅜ by 8⅝ in., illustrated. Price, $1.52. Published by John Wiley & Sons, Inc., New York, N. Y.

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(Continued on page 46A)

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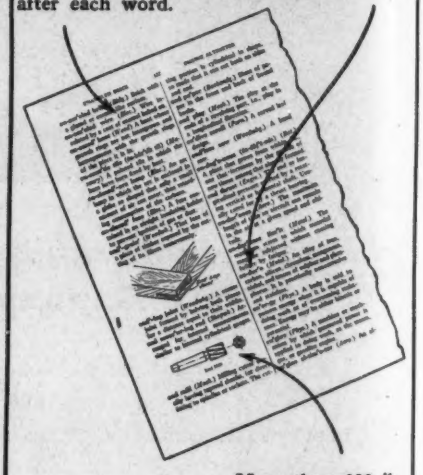

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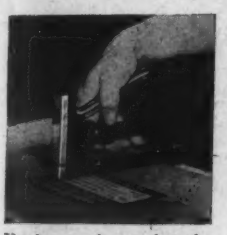

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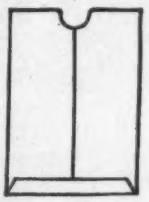

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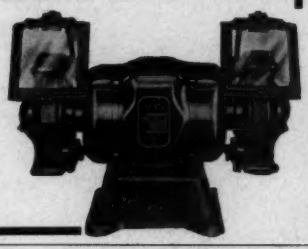

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(Continued from page 44A)

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Written by a teacher of applied art, this book gives suggestions that combine the practical with the artistic.

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By J. W. Giachino. Cloth, 123 pages, 7 by 10⅛ in., illustrated. Price, $1.96. The Manual Arts Press, Peoria, Ill.

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Shop Mathematics at Work

By Paul L. Welton and William W. Rogers. Leatherette, looseleaf, 208 pages, 8⅓ by 10¾ in., illustrated. Price, $1.56. Published by Silver, Burdett & Co., New York, N. Y.

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By Gilbert W. Wernicke, Instructor, Horticulture and Plant Biology, Lakewood High School, Lakewood, Ohio. Published by Science Research Associates, 600 South Michigan Ave., Chicago, Ill.

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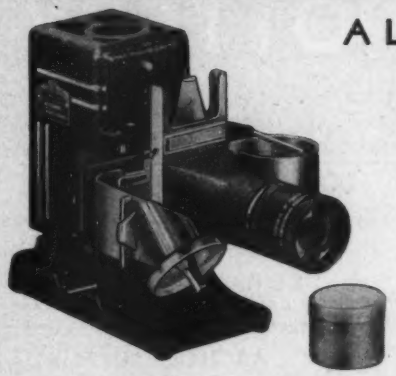

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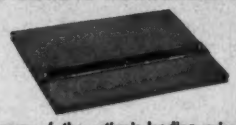

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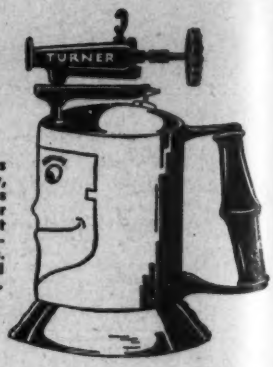

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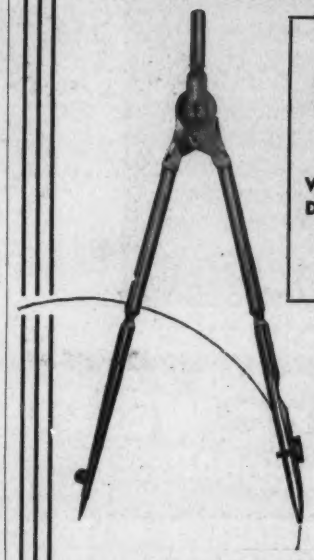

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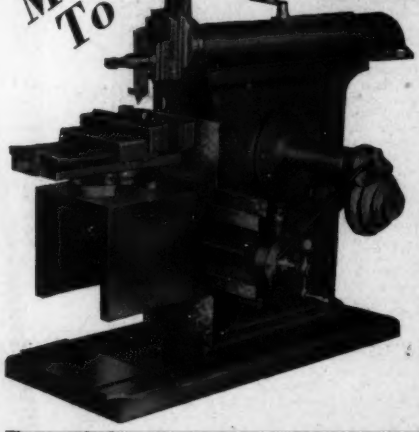

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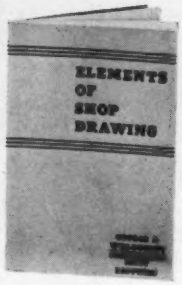

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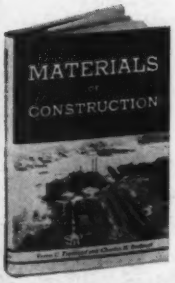

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